THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVI. No. 1687.] LONDON, SEPTEMBER 10, 1895. [47TH YEAR. PRICE 6d.

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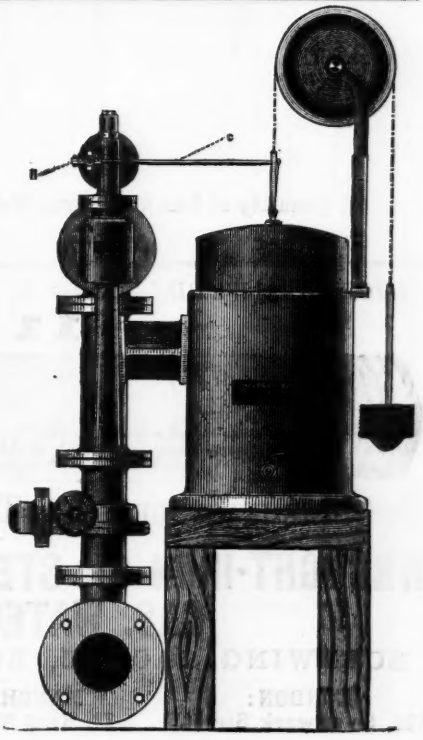

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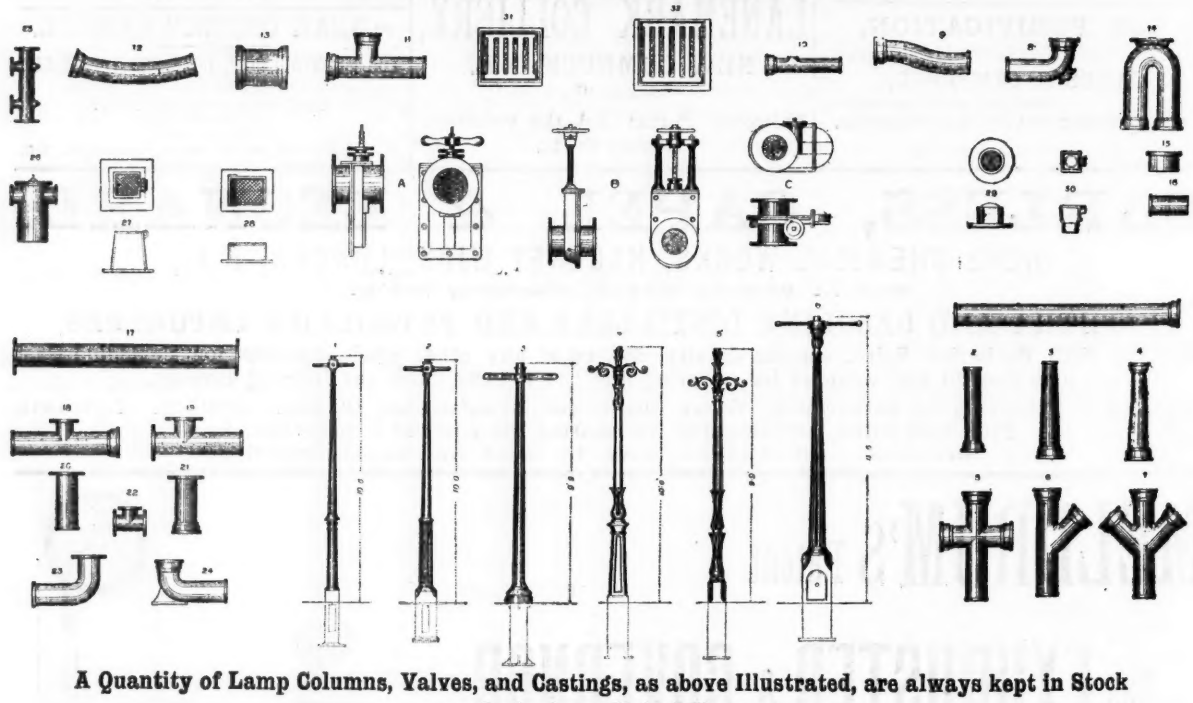

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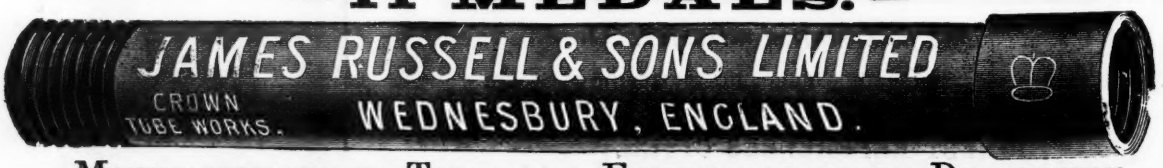

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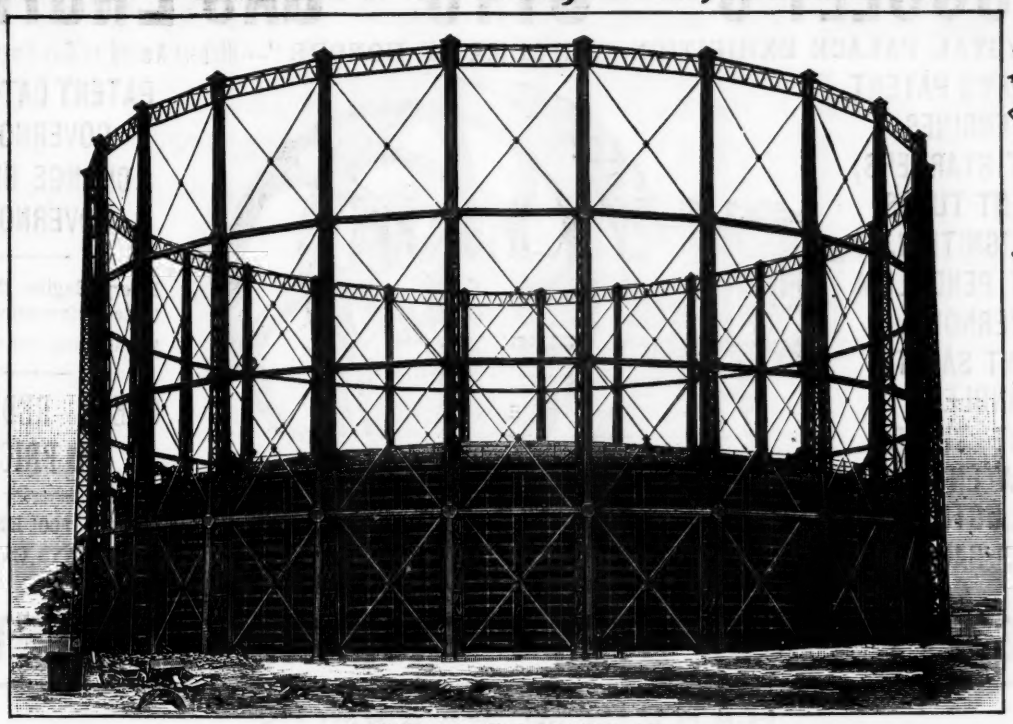

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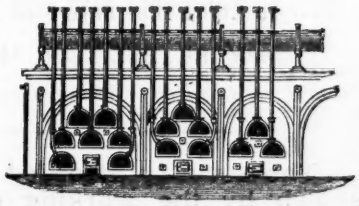

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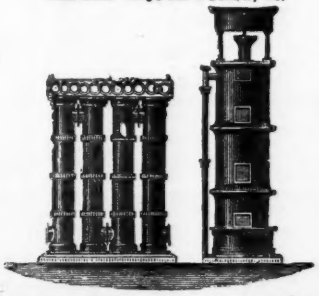

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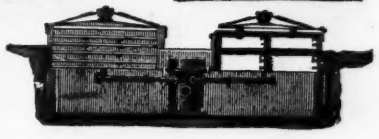

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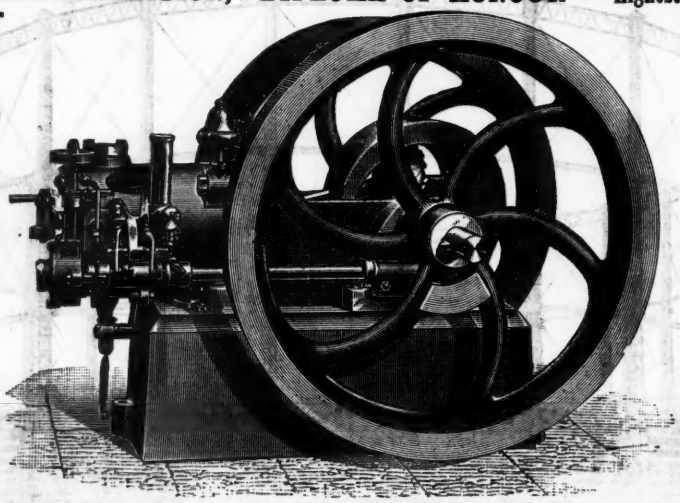

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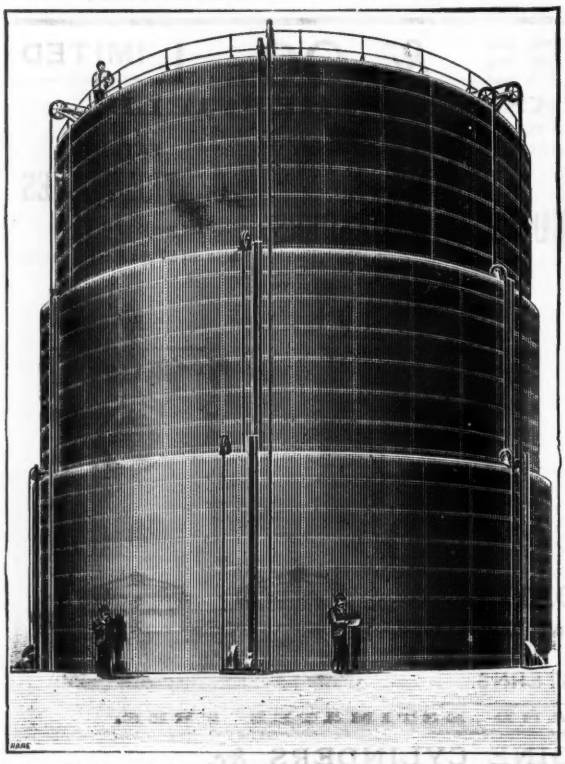

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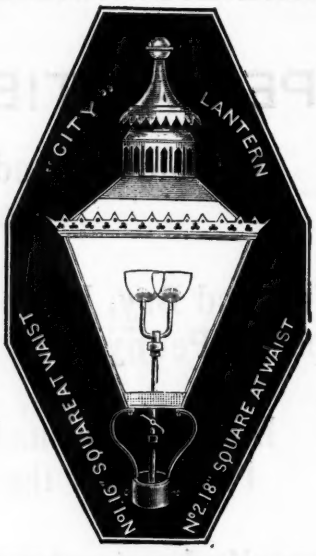

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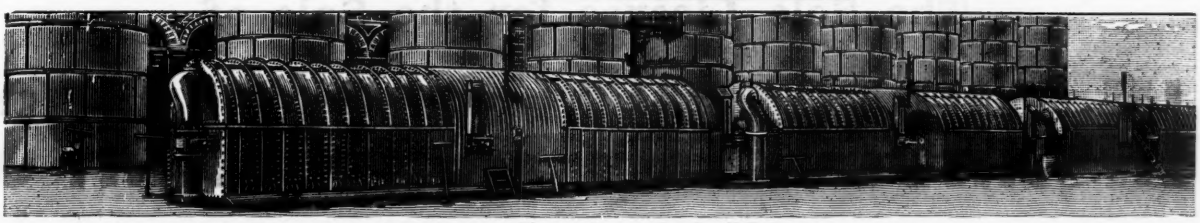

View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company have 30 of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and Abroad.

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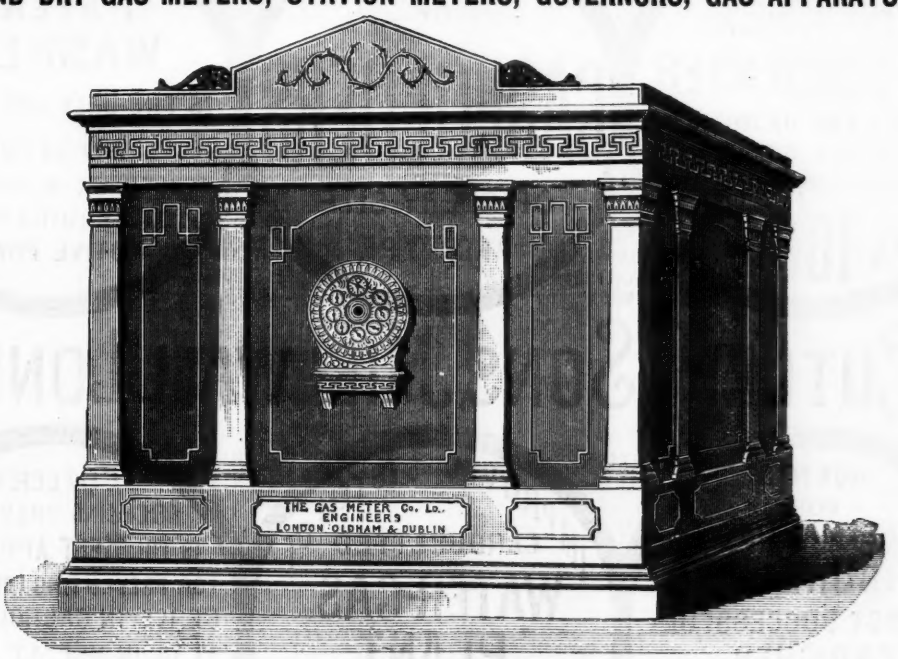

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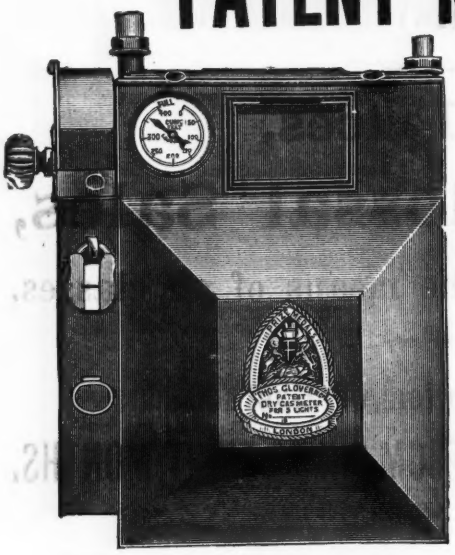

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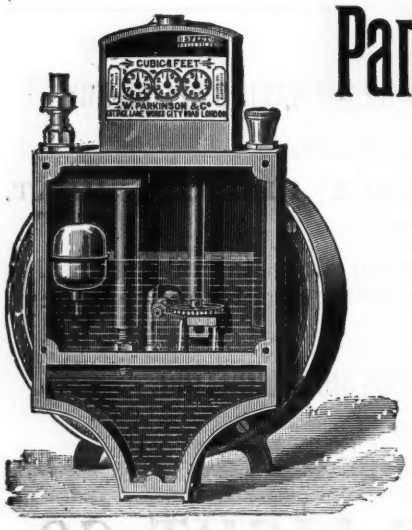

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[See also Advt. p. 564.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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EDITORIAL NOTES.

An Elementary Problem.

SEVERAL proposals for the transfer of gas undertakings from companies to local authorities were sanctioned by Parliament during the past session; some schemes being based upon agreements between the parties, and others involving the principle of compulsory purchase. We have no intention of discussing the details of any of these transactions, but desire to draw our readers' attention once more to the elementary facts of the position of gas capital when in private hands and under public control respectively. It is a commonplace of the gas industry of these kingdoms that private gas capital is irredeemable; while when such capital is raised on the security of local rates, it must be paid off within some period varying from the lifetime of one-and-a-half to two generations. At one period, the longer range for the process of redemption was the rule. But it is now many years ago that Sir Stafford Northcote became alarmed at the propensity of local authorities for incurring debts which were left over for posterity to pay; and he procured a general curtailment of the period for redemption. Whether the process of redemption for local loans is long or short, however, the essential point of such loans remains. They are always repayable, and necessitate the starting and maintenance of a sinking fund for this object. Gas stocks and shares, on the contrary, are perpetual. Now this is an age when all kinds of constants and coefficients are being overhauled and redetermined. The chemists are the great exemplars of this policy of revision; and once, as all the world knows, in the process of reinvestigating the composition of the atmosphere something was discovered that had previously been overlooked. In many other matters besides the data of chemical science, however, people nowadays ask themselves and others what is the foundation of, and continuing justification for, rules and working constants that have been handed down from our predecessors with more or less repute for validity. The ordinary man has to take without question a great number of these conventions; and it is the business of men of many professions, such as that of the law, to master as many "rules of procedure" as possible, in order that the transactions of civilized life may be facilitated by following precedents.

Now and again, however, the practitioner of business according to the usual forms is confronted by a searching inquiry from somebody who cannot be waved off or frowned down, as to the why and the wherefore of a convention; and then it often happens that the expert is nonplussed. The childlike innocence and ignorance of things which are mere commonplaces to "the man in the street" occasionally manifested by British Judges, have been made the subject of scornful remark by the fellows of the omniscient personality in question. But the thoughtful observer perceives easily enough the drift of the careful inquiries of the Court. It is that matters bearing upon the issue shall go upon the record with full explanation, so that future references shall be intelligible. It is very difficult for persons living actively in the present to make sure that what they may say or do will be as intelligible a generation hence as it is to-day. One of the peculiar advantages of a Parliamentary Committee as a means of investigating the merits of a project of legislation, consists in the preponderance in such a body of the ordinary lay mind. A member of such a Committee can (and not infrequently does) ask of Counsel or expert, questions which a lawyer or technically trained person would never think of putting; and he so gets right through many a fine old crusted convention. This year, somebody asked in Committee on a Gas Bill what was the justification for the customary addition of 10 per cent. to the value of an undertaking for compulsory purchase; and the question was somewhat of a "poser."

Suppose now it should be asked, in a similar way, why public gas capital is redeemable in a term of years, and private gas capital is an eternal investment—how is such a query to be best answered? If the JOURNAL were one of the new periodicals which are not meant to be read, still less to be kept and bound for reference, but are mere counters for thinly-disguised gambling, we might stimulate interest in this problem by offering a prize for the best solution forwarded to us in course of post. As it is, we shall be pleased to receive communications bearing upon

the subject from all who know or who would like to be informed as to the rights of it.

A Question of Nomenclature.

THE study of words is always a fascinating mental exercise for everybody who happens to be sufficiently educated to begin with to appreciate the vital importance of precision in expression. One meets in the unlikeliest places with examples of men who have made words their study; for as men who are "practical" in the highest meaning of the term are fully aware, it is to the man of action and of affairs, rather than to the scholar or the arm-chair philosopher, that the proper use and comprehension of language is of prime importance. It matters little what value merely literary men attach to words intended only to amuse or to interest readers of "fine letters;" but the right use and understanding of words are matters of life and death, of fortune or ruin, of success or failure, to the soldier, the lawyer, the man of business and of industry. The great Duke it was who declared that there is nothing so valuable as an exact definition; and he was himself as careful in the employment of language as he was of all other concerns in his momentous career. So it is with peculiar pleasure that we have noticed in the recent public discussions of various forms of profit-sharing, a marked desire on the part of those who took part in them to be careful to distinguish the known varieties of the general plan by properly descriptive names. In connection with the International Co-operative Congress in London, and the National Co-operative Exhibition and Festival at the Crystal Palace, profit-sharing was discussed and applauded in principle; and several suggestive terms—such as "participation," "co-partnership," and other words of like (but not identical) meaning—were commended for consideration in this regard. Lastly, there has just been issued by the Labour Department of the Board of Trade a valuable report by Mr. D. F. Schloss, on "Gain-Sharing," which is an important contribution to the literature of the subject. The motive of this compilation is explained to be that of presenting in a collected form information concerning "certain systems "of industrial remuneration which, while they bear, at "first sight, a superficial resemblance [to profit-sharing] "are yet in fact essentially divergent in character from "any form" of this system. The fundamental distinction between the systems drawn by Mr. Schloss is that "while "under a scheme of profit-sharing the employee receives, "by way of bonus, in addition to his ordinary wages, a "share in the profits of the business in which he is "engaged," under the other systems "the employee "receives, as an incentive to the display of a special degree "of efficiency, a bonus, the amount of which is altogether "independent of the profits earned, or the losses incurred "in the business, and which is strictly proportionate to "the extra activity, carefulness, and intelligence exhibited "by him, measured by the reduction effected in the cost "of production as compared with certain standard costs." Any such system is consequently a sort of half-way house on the way to industrial co-partnership; and, as such, it is attainable under conditions which appear to preclude the complete plan. We may have another opportunity for discussing Mr. Schloss's report in detail, but for the present only desire to call attention to the evidence its appearance supplies of the diversity of the main subject, and the corresponding obligation to be careful as to the terms by which the various developments are described.

Gas-Testing Extraordinary.

NOTHING has been heard of late as to the perambulating photometer that at one time threatened to make the lives of Metropolitan gas-works managers burdensome to them. But, according to a report of the proceedings of the Edinburgh Town Council this day week, a Liverpool Corporation Committee have "gone" considerably "better" than the London photometrist with the wheelbarrow, inasmuch as they have been taking a gas-tester and all his paraphernalia about with them upon a circular tour of English and Scotch cities, with the laudable desire to find out for themselves what quality of gas the aborigines were receiving. The Edinburgh people were made aware of what has been going on in this way by Mr. Councillor Mackenzie, who has recently travelled as far south as Liverpool, where he learnt that somebody enjoying local reputation as an expert, had had the temerity to test Edinburgh gas "in the Balmoral Hotel," with the result that the illuminating power was found to be only 20·65 candles with the standard burner, and 16·48 with what is described as the "ordinary" burner. Having escaped to Edinburgh, Mr. Mackenzie looked up the recorded tests of the local gas supply for the period of the Liverpool gentleman's invasion, and found the illuminating power entered as something between 24 and 25 candles. He asked, at the last meeting of the Town Council, why these things were so. But his interpellation was not at all well received; one of his colleagues even twitting him with entertaining a desire to puff the electric light, in which he is specially interested, to the disadvantage of the local gas supply. Apart from all such personal and local considerations, the prospect of inter-municipal spying opened out by Mr. Mackenzie's revelations, is not a pleasant one. The circular-of-inquiry nuisance was and is bad enough in all conscience; but it had at least the saving virtue that whosoever had an objection to reply to inquisitorial queries could always "basket" the paper. If, however, corporation deputations are to go about with photometrists in their train, testing on the sly the gas of foreign but friendly parts, with intent to make a note of the results—well, there will be no means of stopping them, so long as their own public are willing to pay the expenses; but one result of such photometrical peregrinations will be to bring gas-testing in general into contempt. The interchange of visits to one another's testing-stations by equally experienced and accredited gas-testers is one thing; this "snap-shot" testing of gas at hotels is another. If the latter is reliable, then the regulation testing-station is altogether superfluous, and ought to be done away with. If the regulations and conventions usually applied to the systematic testing of gas are worth anything at all, then the snap-shot operator is wasting his time on his enterprise, and those who pay him are squandering their money. If there is any middle way out of the difficulty, we should like to know of it.

Trade Unionists at Cardiff.

THE Trade Union Congress has been having what might be colloquially styled "a high old time" at Cardiff during the past week. As was expected, the representatives of the Old and the New Trade Unionism had their pitched battle at the earliest possible moment over the question of the revised Standing Orders; and the latter were signally worsted. It was the lesson of the general election over again. Trade Unionism, like other human inventions, has its good and bad sides; but, whether good or bad, it seems hardly a subject for dispute that those who represent the institution before the world should be *bonâ fide* what they claim and are understood to be—followers of trades organized and combined for the furtherance of trade objects and the defence of trade interests. Yet—owing to a variety of circumstances which can hardly be explained, but are thoroughly understood by all who have taken any notice of the facts of recent industrial history—the representation of organized labour has to a great extent been usurped by a set of men who have not, and never had, any connection with the real or titular trades of which they posed as "leaders." The position of the older Trade Unions has never been quite so bad as that into which the newer ones were actually born. They have not been free from grave errors of policy; but, as a general rule, they have retained in office and in power men who are, or have been, real "tradesmen" in the proper sense of the term. The prestige and property of the best Trade Unions attracted the attention and excited the covetousness of several demagogues, such as those who climbed into notoriety as organizers of the unskilled "trades." But it was significant of much that not in the hey-day of their fame, with many newspapers ready to echo and acclaim their loud harangues, would the Amalgamated Society of Engineers, for example, have anything to do with Mr. Tom Mann, and very little with another noisy member, Mr. John Burns. These and other individuals of the same stamp, and of less repute, were accordingly driven to construct pedestals and find support for themselves and their "views" out of the complaisance—to say nothing of the ignorance—of the great reserve of unskilled labourers. The field was for some years a fruitful one, yielding abundantly to those who had the knack of cultivating it. New Unions sprang up on all sides; and as a Trade

Union is a Trade Union, the time came with great suddenness when the representatives of the established organizations of this order found themselves swamped in Congress, outvoted, brow-beaten, and dragged ignominiously at the tail of the once ragged regiment of Socialists who had had the address to seize upon New Unionism as a fresh and profitable branch of their old calling of agitation against a civilization that expects men to work for their living. There is on the face of it no more reason why a Trade Unionist should be a Socialist than there is for his being a Mormon. But, greatly to the disgust of many sober workmen with a little money in the savings bank, the majority in Trade Unionist representation was for several years composed of hare-brained "Collectivists," whose folly culminated in the passing of the Norwich nationalization resolution last year. That settled it—and them. It became the most immediate question of practical Trade Union politics whether such curious excrescences as the "Gasworker" Dr. Aveling should be permitted to stand before the community as embodying the essence of Trade Unionism, or that the Congress should be composed of representative workmen. The question has been answered in the latter sense by an overwhelming vote; and the parasites of Trade Unionism are ordered off. It is reported that these rejected ones held an indignation meeting all to themselves at Cardiff; and if they succeeded in carrying it off without laughing in one another's faces, they should be credited with great histrionic ability. Several of them must have been wondering, not that the game of "Labour "representation" was up at last, but that it should have been played so long. Meanwhile, this year's Congress has not displayed any remarkable improvement, in the matter of judgment and practical common sense, upon its predecessors. The members have been amusing themselves with resolutions in favour of a universal legal eight hours' day and other playthings. But, at any rate, the Congress has now been reconstructed upon its original basis; and better things may be in store for it in the future, when the best members of the associated trades shall have learnt that to belong to a Trade Society is not the whole duty of the workman.

The British Association Meeting.

THE British Association for the Advancement of Science will meet at Ipswich to-morrow, under the presidency of Sir Douglas Galton, who succeeds the Marquis of Salisbury. The new President has for 25 years been General Secretary of the Association; and he is a man of very considerable ability in several branches of scientific research. Some interesting papers and discussions are promised for this year's meeting; and several of these will refer to subjects that have been mentioned and debated of late in the JOURNAL. We shall, of course, take special note of these communications; but the principal interest of the meeting, as usual, will in all probability be centred in the presidential addresses and other summaries of the state of scientific knowledge of the period. Few workers in science nowadays reserve their most original productions for the British Association; and the notable exception of last year—the paper on Argon—is not likely to be paralleled on this occasion. The working men's lecture this year should be a good one. It has been entrusted to Professor Fison, who has chosen for his subject "Colour" —a topic capable of almost infinite expansion. The lists of papers in some of the sections, notably that of chemistry, are not particularly promising. But, by way of compensation, it is reported that the Association will try the experiment that has been found to answer so well at some other recent congresses of the kind, and will hold some formally-arranged discussions upon debateable points of general scientific interest. The proceedings in the section of Political Economy and Statistics are likely to be as important as any of the business of the meeting. The President, Mr. L. L. Price, is credited with a sound grasp of the subject; and several attractive papers are promised.

The Management of the Tonbridge and Cambuslang Gas Companies.—For the vacant position of Manager of the Tonbridge Gas Company recently advertised in the JOURNAL, there were, we learn, 117 applications; and the successful candidate is Mr. James Donaldson, the Engineer of the Cambuslang (N.B.) Gas Company, Limited. The Directors of this Company entrusted to Mr. Donaldson the duty of selecting his successor; and he has chosen Mr. Robert Simpson, of the Tradeston (Glasgow) Gas-Works.

WATER AND SANITARY AFFAIRS.

THE decision of the President of the Local Government Board to hold a departmental inquiry into the state of the water supply in the East of London, has met with general approval. The *Daily Chronicle* considers that Mr. Chaplin has "done the right thing;" and the *Pall Mall Gazette* says "now we are on the road to learn who and what were "to blame for the failure of the supply." At a meeting of the Directors of the East London Company, the Chairman (Mr. George Banbury) alluded to the determination of the Local Government Board to institute an inquiry into the recent events connected with the water supply of the East-end, as "a source of extreme gratification" to himself and his colleagues. We felt assured that such would be the feeling on the part of the Directors; and we are glad to find it so unequivocally expressed. The Secretary (Mr. I. A. Crookenden) has been directed to instruct the officers of the Company to furnish all possible information for the purposes of the inquiry, and to help forward the investigation to the best of their ability. Nothing will be wanting, therefore, on the part of the Company to render the proceedings effectual to the elucidation of the truth of the whole matter. The plan of the inquiry is well laid out. In the first place, it has reference to the circumstances which occasioned deficiency in the supply; in the next place, consideration is to be given to the effect of the deficient supply on the public health; and, finally, a conclusion is to be arrived at as to the means which should be adopted with a view to prevent a recurrence of any deficiency in the future supply of water to the district. As to this third element in the inquiry, the *Daily Chronicle* imagines that "most people have made up their minds by this time." The only way out of the difficulty is said to be "public con- "trol or acquisition." Mr. Chaplin's inquiry is accordingly made to appear somewhat superfluous; the main issue being already determined. Yet there may not be perfect identity between "control" and "acquisition." What Parliament has to say to the latter method, we shall learn in the session of 1896. "Control" is another matter, only there is a considerable amount of it already. But even "acquisition" is capable of a twofold interpretation. It may not be that the County Council should acquire the property of the Water Companies. Some better device is quite practicable; and we have again to urge upon the Corporation of the City that they should cut themselves adrift from the County Council, and seek a better haven than that of Spring Gardens. So far as the East London affair is concerned, it is important to get an official declaration as to the cause of the deficient supply. A lack of reservoir capacity is a ready answer; and it certainly appears that the shrinking of the water in the reservoirs was the fact which influenced the Directors in somewhat suddenly limiting the supply. The delivery now is a large one. But the season has changed; and the reservoirs are being replenished. The fact to which we alluded last week must not be lost sight of—that the East London Company have not the broad Thames at command, and require a larger amount of artificial storage than the other Companies. But these are points which we may expect to hear authoritatively dealt with ere long. With this inquiry pending, it is eminently absurd to find the County Council seeking for evidence on which to establish legal proceedings against the East London Company. If the latter are in fault, we shall soon learn it from the Government inquiry. But in the meantime, the Council, by means of a double Committee, are conducting an independent inquiry, with a view to the prosecution of the Company for failing to give a constant supply, while furnishing an ample supply to those consumers who took it by meter. Such are the allegations. But if the Council mean to say that the Company, during the drought which prevailed in July, were able to give a constant supply all round, we expect to find Mr. Chaplin's inquiry yielding sufficient proof that the assumption is ridiculous.

A return moved for by Sir Albert Rollit in respect to the relative presence of the constant and intermittent supply in the several parishes of the Metropolis, has the appearance of being singularly ornate and unnecessary. That it should be granted may be taken as signifying that the Government do not wish to appear desirous of withholding any information that may seem to at all bear upon

the Metropolitan Water Question. The organ which appears under the name of *London*, speaking for the County Council, says the return is to show the state of the supply in the Metropolitan "districts." But the phraseology is that of "parishes," which at once introduces a needless and troublesome detail. Is it not sufficient to know, as shown by General Scott's monthly report, what is the percentage of the constant supply in the "districts" served by the Companies; the broad result being that, if we take the Metropolis throughout, about 80 per cent. of the total number of services are on the constant system. In the East London district, 99 per cent. of the supplies are constant; and in the Grand Junction, 100 per cent. Yet *London* tells us that the return obtained by Sir A. Rollit "can but have the effect of emphasizing still further the "inadequacy of the London Water Supply, and the "danger which arises from having only a supply of water "for an hour or two a day." The same journal says that only the East London and the Grand Junction Companies give a constant supply. Yet surely the Southwark and Vauxhall Company deserve credit for having 93 per cent. of their supplies constant? The remark is made that, if the Grand Junction constant supply is of the same nature as that of the East London Company, "it is far from "adequate." The "if" breaks down; for the supply given by the Grand Junction Company in June last was within a small fraction of 56 gallons per head; the next in magnitude being Chelsea, with less than 48 gallons per head. The figures in *London* are described as taken from "the last report" by the Public Control Department of the County Council. But the statistics thus obtained are evidently not up to date. It is stated that, prior to the recent drought, nearly 120,000 houses in the East London Company's area obtained only an intermittent supply. Yet General Scott's report for March shows that the houses having an intermittent supply in the Company's district, both inside and outside the Metropolitan boundary, were only about 1000 in all. If our contemporary would knock off a couple of ciphers, they would come tolerably near the mark, and would perhaps be right for some period last year. We have observed on a previous occasion that, although General Scott's reports are sent to Spring Gardens, they do not appear to be read in that region.

Mr. Henry L. Cripps had a letter a column long in *The Times* of Saturday last, professedly on the subject of the East London water supply, but in reality directed against the Metropolitan Water Companies in general. Another letter is to follow, intended for the special demolition of the East London Company. Mr. Cripps is of opinion that it is time the London Water Question was settled. We venture to suggest that the really disturbing element is the London County Council. Mr. Cripps complains that, whereas he had the conduct of the Water Transfer Bills in the recent session of Parliament, he had "to "encounter the strongest possible opposition from the "Companies and their friends at every stage;" and he would have it appear that thus the settlement of the question has been delayed. But Mr. Cripps omits to explain that this opposition arose from the extraordinary conditions laid down in the Bills, by which the Companies were exposed to treatment of a most unfair description. Thus, as we have said on a former occasion, if the Companies are to be bought up, the way has been blocked by the County Council, in proposing impossible terms. As Mr. Cripps has not yet said his last word, we wait to hear it, before dealing at further length with his remarks.

Presentation to Mr. Cornish of Bridport.—The employees and workpeople of the Bridport Gas Company, on Thursday last, presented to Mr. J. H. Cornish, their Manager and Secretary, a very pretty dining-room timepiece, in commemoration of his marriage, which had recently taken place. After the presentation, Mr. Cornish entertained the employees at dinner, which was enlivened by music; a very pleasant evening being spent.

A Gas Manager's Son Drowned.—The sympathy of a large number of our readers will be extended to Mr. James Bailey, the Manager of the Middlewich Gas-Works, in the loss which has befallen him by the sudden death of his son Alfred, under sad circumstances. The boy was playing last Wednesday near the North Staffordshire Canal, at Middlewich, when he slipped into the water, and was drowned. Mr. Bailey was informed of the occurrence, and himself recovered his son's body in about ten minutes, but life was extinct. It is a curious coincidence that the former Manager at Middlewich (Mr. Peter Hancock) met his death by drowning in the same canal early in 1893.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 652.)

Business on the Stock Exchange last week was decidedly quieter; the spirit of activity which enlivened the previous week having almost entirely died away. Every now and then, there were signs of a little more animation being imparted to the markets; but they did not come to much. Even the South African market failed to keep up its usual buoyancy, and would have been almost tame, except for the big banking speculation recently launched upon it. But prices on the whole did not suffer; and perhaps balancing the losses on one side against the gains on another, a tolerable equilibrium was the result. The Money Market was as easy as ever, wanting even the mild stimulus of the fortnightly settlement. Business in Gas securities was very fair, when the time of year is taken into account; and transactions were quite up to the average of the dead season. It follows almost as a matter of course that there was no abatement of the continued firmness; and so long as the strong demand for good investment securities exists, so long may we expect that Gas stocks will hold their own. Changes in quotations are not numerous; but they are all in the upward direction. In Gaslights, the favourable signs apparent in the "A" stock a week ago were realized after a little hesitation, and a point in advance was scored. The other issues were in good demand, and strong generally, though the 6 per cent. debentures was the only one actually to advance. South Metropolitans were more active, and maintained (though they did not improve upon) their recent advance. Commercials were hardly touched. The Suburban and Provincial group were more than usually inactive, and not a quotation moved. The Continentals, on the other hand, were more brisk, and showed decided strength; Union and Cagliari making smart advances. Among the rest, there was no lack of business; but Australian debenture was the only one to move. Transactions in Water stocks showed a greater degree of activity; and prices were inclined to be steadier, although Southwark ordinary had a fall.

The daily operations were: Business in the Gas Market was rather more active on the opening day; and the general run of prices was very good. Continental Union preference advanced 4; and Australian debentures, 2. Transactions on Tuesday were much about the same; but the only change in price was a rise of 1 in Cagliari. Wednesday was perhaps the quietest day of the week; and there was no movement of any sort. Greater activity set in again on Thursday, especially in Gaslight "A," which promised to improve; but nothing moved on that day. In Water, Southwark ordinary fell 3. Things continued brisk and buoyant on Friday. Gaslight "A" rose 1; ditto 6 per cent. debenture, 2; and Cagliari, 1. Saturday's business was about the average; and quotations closed without further change.

ELECTRIC LIGHTING MEMORANDA.

Affairs Electrical in Liverpool—The Reward of Enterprise in Londonderry—The Prospects of Accumulator Traction.

There seems to be something peculiar, to judge from the reported proceedings of the Liverpool City Council which will be found in another column, about the arrangements for the transfer of the undertaking of the local Electric Light Company to the Corporation. We purposely refrain from expressing any opinion as to the merits of this transaction, and shall rest content to notice it as a matter of fact. The Corporation appear to regard the bargain as satisfactory, in the interests of the city; and the shareholders (unlike those of many other companies of the kind) ought to be glad to get their money back, with a premium on their venture. Of course, Liverpool wants electric light, just as it needs every other luxury of civilization; and there are many citizens who can afford to pay for it. Whether the Corporation, who were among the first municipal authorities in England to inquire into the new system of lighting, were well or ill advised in allowing a private company to undertake the exploitation of the new light in the city, instead of doing the work themselves, is now an idle question, which may well be left out of consideration. Whatever may be the prevailing tone of local opinion in this regard, it is at least open to be argued that, by acting as they did, the Corporation allowed the public to have the advantage of electric lighting at an earlier period than would have been practicable if the venture had been municipalized from the first. In this respect, Liverpool has been in agreement with Birmingham, and (as usual) out of harmony with Manchester, which has only tardily provided its citizens with electric light from a corporation station.

It is a proof of the possession by Mr. John Christie, the Electrical Engineer to the Corporation of Londonderry, of no small amount of courage, that he brought the story of the establishment of electric lighting in the city before the members of the Association of Municipal and County Engineers on the occasion of the recent meeting of the Association to the scene of so dismal an experience. Londonderry rushed in where Liverpool feared to tread, with consequences that have been reported in our columns on several occasions. The latest

information on this subject, as given to the world by Mr. Christie, is that Londonderry now pays £4000 a year for public lighting, as against the £2200 formerly paid for gas. The reflections uttered by the local newspapers upon this brilliant result of the enterprise of the Municipality, are not complimentary to those who were responsible for the venture. In discussing Mr. Christie's communication, several of the visitors to Londonderry ventured to ask why the new light was installed in such circumstances; and the local press, with brutal candour, has declared that "nobody had the hardihood to rise and explain that the light was introduced by means of the most disgraceful exhibition of false pretences that could well be imagined." It is further alleged that "outrageous figures, showing a profit as compared with gas, were concocted." We have seen a good many of such computations; but to Londonderry belongs the sad consolation of having been one of the first cities deluded by prophesying electricians to discover its error. "The scheme has reduced the Corporation finances to a condition bordering on bankruptcy;" and there is no other outlook for it but that "matters must drift from bad to worse until either the rates are raised or the electric light abandoned." Even so, the folly of the Corporation will continue to be visited on the ratepayers for many years to come.

Some interesting information concerning the results of the application of secondary electric batteries to tramway working was published at the recent meeting of the Birmingham Central Tramways Company. Among other points illustrated, was that of the necessity of caution in accepting an early provisional success in the use of electricity as an augury of continued triumph. Last year the then Chairman of the Company spoke of their accumulator car venture as one of "mingled difficulty and hope." Yet the cars had seemed to be through their initial difficulties, and were credited with having actually earned a profit of over £1200. This year the promise of success has given place to a loss of £1735, attributed by the official apologist for the Company to all sorts of unfavourable influences, rather than to the system of working. The fact remains, however, that accumulator traction is not doing so particularly well in Birmingham that the application is likely to be extended either in that city or elsewhere about England. Even the *Electrician* is disposed to give up the system as hopeless. It is acknowledged that "the Birmingham line is not an abnormally trying one; that several types of cell have been employed; and that these experiments on a commercial scale have now lasted several years." The moral drawn by our contemporary from this recital, with reference to the views of "individuals who affect to believe in electric omnibuses," is that "it would be as well to learn to walk before attempting to run." The observation applies with particular force to the competition for the *Engineer* prizes for mechanically-driven road carriages, which some people, without the smallest reason, have pretended to regard as safe to go to some combination of the electrician and the carriage builder. The truth is, as we have often had occasion to observe, that to the vast number of vague persons who air their notions about things in general in the newspapers and at corporation meetings, the word "electricity" is still as full of mysterious promise as "that blessed word, Mesopotamia," was of comfort to the old lady of the story. No amount of disillusionment, short of the loss of their own money in an electric speculation, seems to affect the childlike faith of these individuals in the pet fetish of latter-day sciolists; and so it happens that they are found again and again voting other people's money away in connection with schemes the hollowness of which prevents their being heard of otherwise than as indications of "municipal enterprise." It is a striking reflection that, in regard to this matter of the development of electric power, the keenest and most feeble intellects experience the same fascination with the subject, albeit the nature of the attraction differs.

Mr. J. W. Walker, the Manager of the Colnbrook Gas Company, has come to an arrangement with his Directors for leasing the works from Oct. 1 next.

A New Refractory Substance.—A correspondent of the *Colliery Guardian* says that, under the name of apyrite, Herren Schiffer and Kircher, of Grunstadt, in Rhenish Bavaria, work a mineral containing about 93 per cent. of silica, and consequently very refractory. When mixed with water, it forms a plastic and adhesive mass, which, after desiccation, becomes firm and resisting, while its volume does not change when exposed to the fire. Moreover, it is scarcely attacked by metals and scoria in fusion, which either do not stick to the surfaces made with it or are easily removed without the least detriment to the furnace. In the neighbourhood of the mines, apyrite, tempered with water, is used instead of lime mortar, and also for plastering. Slightly damped, this substance is punned so as to supersede fire-brick lining; and a large foundry cupola can thus be lined in a day by two men, while such a lining lasts longer than one of the same substance made up into bricks. For repairs to the fire-brick lining of furnaces, apyrite is also very useful, while its low price, and the fact that it is a good non-conductor of heat, recommend it in the case of blast-furnaces, puddling and heating furnaces, foundry cupolas, and crucible furnaces. The following is the composition of two qualities, the pure and the rich: SiO_2, 92·37 and 90·95; Al_2O_3, 5·1 and 9·45; Fe_2O_3, CaO, MgO, and K_2O together, 0·37 and 1·05; and H_2O, 1·73 and 2.

GAS ACTS FOR 1895.

Second Article.

THE Brighouse Corporation Act contains provisions for authorizing the sale of the undertaking of the Rastrick Gas Company to the Corporation. The district was incorporated as a municipal borough by Royal Charter in 1893, and the Company had an Act in 1865. It was during the negotiation of the Charter that an agreement to transfer the gas undertaking to the nascent Corporation was concluded between the Company and a Committee formed for promoting the incorporation of the town. The Company had a capital of £22,000, and had borrowed £2500 on mortgage. Part of the borough, moreover (known as Hove Edge), was partly included within the gas limits of the Halifax Corporation, who had agreed to sell and transfer their rights over this area to the Brighouse Corporation. The Act provides that the purchase money for the gas undertaking is to be £47,500, exclusive of the mortgage debt, which is to be taken over and paid by the Corporation. The Company retain their reserve fund of £1956, and receive the costs of the transfer. The price of gas is not to exceed 4s. per 1000 cubic feet; and interest at the rate of 3 per cent. is to be paid on consumers' deposits. The Hove Edge portion of the borough is taken out of the gas limits of the Halifax Corporation. Outlying portions of the undertaking are to be transferable to other local authorities, under a special condition as regards the value to be paid in the event of the transfer of any portion of the district situated within 300 yards of the boundary of the ancient hamlet of Brighouse. The sum of £52,000 is to be raised for the acquisition of the gas-works; and £29,000, for their extension and improvement.

The Clonmel Corporation Act provides for the transfer to the Corporation of the undertaking of the Clonmel Gas Consumers' Company, Limited. The transaction was agreed to between the Company and the Corporation on Nov. 16, 1894, in consideration of the payment of £13,000; and the agreement is confirmed by the Act. In addition to the payment to the Company, a sum of £3000 is required for the purchase of the interests in the undertaking formerly belonging to the British Gas Light Company; and a further sum of £2000 is to be raised for the improvement of the works. The gas limits under the Act are the borough and any places adjacent thereto situate within a radius of three miles from the town hall. The maximum price of gas is to be 6s. 6d. per 1000 cubic feet; and 5 per cent. interest is to be paid on consumers' deposits. Power is given for the formation of a Gas Committee of the Corporation, to consist of not more than five members. The gas-rents may be collected with the general rates.

The Hebden Bridge and Mytholmroyd Gas Board Act constitutes a Gas Board for the urban districts of Hebden Bridge and Mytholmroyd, in the West Riding of Yorkshire, and transfers to and vests in the Board the undertaking of the Hebden Bridge Gas Company. The capital of the Company consisted of £13,670 of 10 per cent. stock, and £16,424 of 7 per cent. shares, with no borrowed money. The Board is constituted of seven members from Hebden Bridge and two from Mytholmroyd—the Chairman to be elected by, and out of, the members of the Board, and three to form a quorum. The scheduled agreement for transfer of the undertaking is confirmed, by which the consideration for the purchase is stated to be the payment of a sum representing 27 years' purchase of the maximum dividends actually paid by the Company. The District Councils are declared to be interested in the undertaking; and are to share in profits or losses or deficiencies in revenue in proportion to the gas consumption of the respective areas for the preceding year. The maximum price of gas is 4s. 6d. per 1000 cubic feet, subject to discounts of from 2½ to 10 per cent. The sum of £103,000 is to be borrowed for the purchase and improvement of the plant; and £5000 for working capital.

The Ambleside Urban District Council (Gas and Water) Act sanctions the transfer of the undertaking of the local Gas and Water Company to the Council. The consideration for the transfer is to be agreed upon between the parties or ascertained by arbitration in accordance with the provisions of the Lands Clauses Act, upon compulsory terms; and in addition thereto the Council are to pay the costs of the Company and compensate their officers. The maximum price of gas is fixed at 5s. 6d. per 1000 cubic feet. Interest at the rate of 4 per cent. is to be paid on consumers' deposits. The money necessary for the purchase is to be borrowed, and also the additional sum of £9000 for the necessary extension of the works, to be repayable in 45 years.

The Chesterfield Gas and Water Board Act constitutes and incorporates a Gas and Water Board for the Borough of Chesterfield and the adjacent districts, in Derbyshire, and transfers to and vests in such Board the undertaking of the Chesterfield Water-Works and Gaslight Company. Associated with the Corporation in this matter are the Urban District Councils of Whittington, Newbold, and Dunston. The Company were first incorporated by an Act of 1855; and their last Act is dated 1876. The present area of supply comprises the borough and districts named, and also the adjacent districts and parishes of Brampton, Walton, Brimington, Hasland, and Tapton. The limits of the Act are stated to be the existing limits of the Company, subject to the proviso that it shall not

be lawful for the Board to extend the existing mains of the Company for the supply of gas in the parishes of Brimington and Whittington without the consent of the Whittington Gas Company, Limited. The Board is to consist of twelve members, of whom eight are to be elected from and by the Chesterfield Town Council. The quorum is to be six members. The sum to be paid for the Company's property is to be determined by agreement or arbitration; and the purchase is to be completed within six months after the publication of the award. Officers and servants of the Company (but not including the Directors or ordinary workmen) who shall have been at least five years in the Company's employment are to be compensated for any loss they may suffer in consequence of the transfer. The Company's mortgage debt is to continue a charge upon the undertaking; but all other debts are to be paid off by the Company. Four per cent. interest is to be paid on consumers' deposits. In addition to the purchase money and the costs of the transfer, the Board are authorized to borrow £30,000 for gas-works purposes. Gas capital is to be repaid in 40 years. In order to raise money for current annual expenditure, the Board are authorized to borrow an amount not exceeding one-half of the estimated revenue of their undertaking, from any bank or other person, upon such terms as may be agreed upon. Surplus gas revenue is to be applied to reduce the price of gas. Although the gas and water undertakings are to be kept separate, any deficiency of the revenue of the one may be made up by borrowing from the reserve fund of the other, subject to the payment of 3 per cent. interest on the amount so taken, and its repayment out of revenue.

NOTES.

Ewing's Extensometer.

The study of the action of parts of iron structures—such as gasholders and their framing—under stress, should be facilitated by the appliance described in a paper read by Professor J. A. Ewing before the Royal Society. The appliance is a new form of extensometer, or apparatus for measuring the elastic stretching of bars. It consists of two cross-pieces attached to the bar by means of a pair of diametrically opposed set-screws. Each piece is separately free to oscillate about the line joining its screw-points; since it does not touch the rod under test at any other place. But the two pieces are caused to engage with one another in such a way as to exhibit the amount of displacement corresponding to that of the extension of the bar under strain. The displacement is shown by one piece; and it is measured by means of a microscope attached to the other. The whole apparatus is self-contained. It is made in two forms, one for laboratory use, when the specimen under test stands vertically; and the other applicable to rods in any position—such as members of structures *in situ*. In the laboratory use of the instrument, the elastic properties of the material are examined by observing the strains under known loads; in the application to structures, the object is to determine experimentally what the stress on any member is from observation of the strain—the modulus of elasticity being assumed. The author described a number of observations made with the new instrument upon rods strained within, and in excess of, their elastic limit. In the latter condition, the elastic properties of a rod are materially different from its properties in a primitive state. On reloading the over-strained rod, it is found that the ratio of strain to stress no longer holds good, and further that the bar continues to stretch (even under light loads) if kept on for a few minutes. Over-strained rods, on the other hand, were observed to recover their elasticity after a few day's rest; the extent of recovery being apparently proportional to the softness of the metal.

Testing Lightning Conductors.

An interesting little instrument, designed to show when lightning conductors have been struck by a discharge, has been invented by Herr Zielinski, of Berlin, and is used by the German Imperial Post Office. It seems calculated to supply a decided want, since it must be a satisfaction to those who have gone to the expense of elaborate lightning protection, to know when this has been put to use, which cannot be ascertained without instrumental indication. Herr Zielinski's apparatus was recently illustrated in the *Electrician*. It consists of a kind of magnetic compass, provided with means of attachment to the lightning conductor. In a glass-covered brass case, a star-shaped compass needle swings upon a steel point. The magnetic star will set itself in the line of the magnetic meridian; and when first connected up for service, the red mark on the needle, or the point of the star opposite, is set towards the lightning conductor. The cover of the box is then put on, so that its pointer marks the same centre-line as the red mark of the needle. If, after this, the conductor is struck by lightning, the magnetism of the needle is disturbed, and the needle becomes newly magnetized in the direction of the lines of force of the discharge. Under the influence of the earth's magnetism, or that of the conductor if the latter is of iron, the star magnet will settle down into a new position. Any deflection of the needle, therefore, is taken as evidence that a lightning discharge has traversed the conductor. It can be easily re-adjusted to show a fresh discharge. Curiously enough, it is claimed that the instrument will only respond to lightning—even heavy discharges of artificially generated current failing to affect it.

Free Helium.

It is frequently observed that, whenever a discovery of something previously unsuspected is made—as that of argon and afterwards of helium in the atmosphere, by Rayleigh and Ramsay—the thing is speedily found in many other places and under familiar conditions; so that it becomes matter of wonder how it can have been overlooked. In the case of helium (hitherto only found in a few minerals, and in a state of combination of which nothing is known), it has recently been reported by Professor H. Kayser, of Bonn, that he has detected it in a free state in Nature, in no more occult a source than the springs of Wildbad, in the Black Forest. The bubbles of gas which these springs give off contain, according to an old analysis, as much as 96 per cent. of nitrogen. Thinking that this looked promising for argon, Professor Kayser submitted the gas to analysis, with the gratifying result of finding both argon and helium—the latter not in a small quantity, as its lines appeared very bright, and could be easily photographed. Thus, for the first time, a place has been discovered where the two gases included under the name helium are "on tap," so to speak, and stream freely out into the atmosphere. Where else helium may be found, and what office it fills where it is found, are wisely left as open questions by Professor Kayser.

The Upsetting of Tie-Rods.

Writing to the *Engineering Record* respecting the strength of tie bars with upset or plain screwed ends (as to which a question has been raised), Mr. G. C. Henning asserts that experiments made on small rods of iron and steel, with threads cut in the rolled end, always showed fracture in the threads, provided the holding nut was not screwed up to the end of the thread. When the nuts were screwed home, the fracture occurred sometimes in the thread and sometimes in the body of the bar. When the latter occurred, the material always showed a lower strength than that specified—proving that the break must have been due to some actual defect. Round bars with upset ends, as usually made, are sure to be weaker than those with threads cut in the solid rolled bar, because the upsetting is usually effected, says Mr. Henning, by heating up the end of the bar to a very high heat, and then producing the upset by hydraulic pressure—afterwards allowing the bar to cool. This leaves the metal in a much weaker condition than it is in the rolled bar, and in a coarsely crystalline state. Instead of this cheap and ready method of upsetting, the work should either be done at a lower heat, or else the end should be upset considerably more, and then worked down to the correct size (under the hammer or press) until the metal has cooled to a low red. In the case of long steel tie-rods with threads cut on the ends, Mr. Henning denies that the rods usually break in the body of the bar, unless the latter is defective. The fact that iron rods do occasionally so break is referred to the fact that long rods are always weaker than short ones—that is, defects will be found in long rods which are only accidentally found in short ones. Steel rods, being very much more uniform, and more free from accidents of manufacture, do not show this difference in so great a degree.

Death of the Town Clerk of Sheffield.—A heavy loss has been sustained by Sheffield through the death of its respected Town Clerk, Mr. J. W. Pye-Smith, on Monday morning of last week. He had only reached the age of 54 years; and the cause of his death was uræmia. Deceased, who was formerly a partner in a firm of solicitors, devoted himself early to municipal work. In 1872 he was elected to the Town Council; and in 1880, he was elevated to the Aldermen's bench. Five years later, he received the highest dignity the town could confer upon him in being appointed Mayor, which honourable position had been filled by his father nearly thirty years previously. In April, 1887, Mr. Pye-Smith was elected Town Clerk. It is curious to note that his appointment was on the very day of the third reading of the Sheffield Corporation Water Bill in the House of Lords—a consummation for which he had laboured hard for several months. Undoubtedly the most memorable piece of municipal work with which Mr. Pye-Smith was actively associated, was the acquisition by the Corporation of the water-works. It was during the year he was Mayor of the borough that this important transaction was formulated and settled; and his colleagues on the Council recognized his peculiar ability to deal with matters of this complicated character by electing him Chairman of the Committee appointed to superintend the parliamentary proceedings. He consequently took a prominent part in the delicate work which is inseparable from business of such magnitude; and it is freely acknowledged that the excellent bargain which the ratepayers secured—admittedly the best that could be obtained—was largely due to his foresight and wise counsel. Mr. Yeomans, the then Town Clerk, died just when the completion of the purchase was in sight; and his death was supposed to be the result of the draughts he encountered while attending the parliamentary proceedings in connection with the Bill. The cost of the undertaking amounted to £2,092,014. Mr. Pye-Smith continued Chairman of the Water Committee until his appointment as Town Clerk.

TECHNICAL RECORD.

MUNICIPAL ENGINEERS ON ELECTRIC LIGHTING.

At the Irish District Meeting of the Incorporated Association of Municipal and County Engineers, recently held in Londonderry, under the presidency of Mr. E. R. S. Escott, a paper descriptive of the electric lighting installation in the city was read by Mr. J. Christie, the Electrical Engineer to the Corporation, and one on the general subject of "Municipal Electricity," by Mr. J. Perry, the County Engineer of Galway.

After a few introductory remarks on the importance of the question of electric lighting to municipal engineers, Mr. Christie stated that in 1893 the Corporation of Londonderry decided to adopt a scheme for the public lighting of the city by means of arc lamps. The one prepared by Mr. Blake was submitted to Dr. John Hopkinson; and, on his approving of the specification, a grant was obtained from the Local Government Board to borrow the necessary estimated capital of £15,000. At present there were two boilers put down. They were of the Lancashire type, 26 feet long and 7 feet in diameter, constructed for a working pressure of 125 lbs. per square inch. The feed-water arrangements comprised two duplex direct-acting pumps, each capable of supplying 900 gallons per hour against the maximum working pressure. The economizer consisted of 96 4-inch tubes 9 feet long. The steam was conveyed to the engine-room by two lines of 9-inch wrought-iron pipes having 6-inch branch-pipes to each boiler. In the engine-room were placed along one side three vertical compound condensing-engines of 150 indicated horse power. The diameter of the high-pressure cylinders was 11 inches, and of the low-pressure ones 22 inches; and the stroke was 18 inches. The average speed at which they were run was 145 revolutions per minute. The distribution of steam was effected in the high-pressure cylinder by a piston valve admitting the steam in the middle and exhausting at the outer edges; and in the low-pressure cylinder by an ordinary trick slide-valve. By this arrangement the high-pressure piston gland was the only one which was subjected to the full working pressure.

Each engine drives two dynamos placed on sliding rails one behind the other. They are of the constant-current series type, made by Messrs. Siemens Bros. and Co., Limited. They were designed for an output of 10 ampères at 3000 volts at 750 revolutions per minute. The Corporation had had them running constantly for nearly 48 months, at 2500 volts, and often had them subjected to the most severe strains possible, and they had given no trouble whatever. To keep the current constant, a very ingenious regulator was provided, which automatically varied the voltage to suit the number of lamps on circuit, by rocking the brushes back or forward. With these regulators in gear, it was almost impossible to get more than 10 ampères for any time; and they gave the current just as well on short circuit as when the whole resistance of the circuit was on. From the dynamos the current was led to the switchboard by means of insulated cables laid in trenches under the engine-room floor. The switchboard was arranged for six dynamos, and four circuits; and it was provided with short-circuit field switches, double-pole fuses, and a Swinbourne electrostatic volt-meter, to each dynamo—each circuit having a Siemens ammeter double-pole fuses, and a Thomson-Houston lightning arrester on each end.

The author went on to explain that the lighting of the city is divided into two sections, each having two circuits with lamps arranged alternately on different circuits. The cables consist of $\frac{1}{16}$-inch copper strand, heavily insulated with vulcanized india-rubber with a covering of bituminized jute armoured with galvanized steel wires, the whole being covered with jute steeped in a preservative compound, and laid in the ground direct. The armouring is earthed at every lamp, and also at the station ends. There are 34 miles of this cable laid—the longest circuit being about nine miles round; and the area lighted is one of the largest in the country. During the first six months after the plant was taken over by the Corporation, they had a most unfortunate time of it, through failures of the lamps, cut cables, and other causes incidental to the starting of such a large scheme. For a long time, this made the electric light most unpopular with many; but Messrs. Siemens successfully surmounted all the many difficulties as they cropped up; and in the very depth of winter entirely relaid the whole of the cables without interrupting the lighting of the city. All these failures, said Mr. Christie, were happily a thing of the past; and now they rarely had even a single lamp failure reported. All the lamps are of the well-known Brockie-Pell double carbon 32-hour type, so that in winter they only require trimming every second day; while in summer once a week suffices. Each lamp has fitted within itself a cut-out, which, should the carbons burn out, or the rods hang up from any cause, automatically cuts the lamp out from the circuit and forms a bye-pass for the current to go on to the next lamp. The lamps are fixed on ornamental cast-iron pillars 25 feet high, and pitched from 75 to 250 yards apart. In the base of each pillar, inside a locked door, an isolating switch is provided, by means of which any separate lamp may be extinguished quite independently of any of the others on the same circuit. Daily insulation resistance tests of all the circuits are taken; and if any one shows below the normal, it is carefully watched, should it become dangerously low.

The cost of the whole scheme up to the present amounts to between £18,000 and £19,000. The financial year is not up till November, and the author regretted that he could not give the exact cost of the public lighting. In winter, during the long nights, the works cost per lamp-hour as low as 0·65d.; and in summer, when the runs are shortest, they reach as high as 1·70d. per lamp-hour. So far as could be judged, the total cost, including everything, should not much exceed £19 per annum, which, considering the number of hours they run, the author thought was by no means excessive. No attempt has yet been made by the Corporation to introduce private lighting; but as they have every facility on the site of the present station for the accommodation and working of all the necessary plant for it, and as the town is particularly well situated for the working up of a most lucrative electricity supply business, he said he had no doubt that before long they would be following the example set them by nearly all the other leading municipalities, and wisely keep the valuable monopoly of supplying electricity to the citizens in their own hands, by extending their present system, and laying down suitable machinery.

Mr. Perry, in introducing the subject of "Municipal Electricity," said that for six years, as part owner and occupier, he had been connected with the public and private supply of electricity in Galway. Electrical engineering was forced upon them, and they had to do their duty in regard to it, as they had done their duty by the other human refinements which had preceded it. There had been for some years in the public mind a confusion between electricians and electrical engineers, which would be paralleled by supposing mariners and astronomers to be the same. Electricians were doing good work for engineers; but a mere electrician was not an engineer. Electricity leaving a central station, passing round an external current, and returning to the station, might be compared to an endless rope driven by a pulley in the station. If they conceived of a rope of that kind passing round capstans and through tight places of one kind and another, they would see that when it was made to circulate it would turn the capstans and heat the tight places. Let them call the speed of the rope ampères, and the tightness of it volts. As many ampères returned to the central station as left it; but the volts varied from point to point. If they multiplied the tightness or pull by the speed, they had the power transmitted at any point. It was of no great consequence how the unit, ampère, and volt had been fixed. The volt meant pressure, or tightness of the rope; the ampère meant speed, or quantity per second. There they were on familiar ground, because 746 watts were a horse-power. When 1000 watts run for an hour, it was called a Board of Trade unit. A unit of electricity, for which they in Galway charged 3d. if used for printing or bottle-washing, or 5d. if used for lighting, was equal to $1\frac{1}{3}$-horse power for one hour. When, however, they had to compare the value of a unit of electricity for lighting purposes with that of 1000 cubic feet of gas, they had the elements of lamps and burners coming in in ways which allowed of a considerable field for discussion between gas conservatives and electric radicals. It was fair at this time of day to accept Gordon's estimate, made long ago, that 1000 cubic feet of gas were equal to 10 units of electricity, which would make electricity at 3d. equal to gas at 2s. 6d. With alternating currents electrical transformation was very simple. It was not so simple for continuous currents; and in this was a great point in favour of alternating currents for certain circumstances. There were disadvantages, and they had electricians who showed some partisanship both for continuous and alternating currents. The engineer would use what best suited his special conditions. Series dynamos were used for arc-lamp lighting, and compound dynamos for incandescent-lamp lighting, with accumulators. For five years he had every night run arc lamps off a shunt dynamo; and he had charged accumulators with both compound and shunt dynamos. With a turbine at an inefficient speed, he had also run incandescent lamps direct from a shunt dynamo without any injury; so that the above rules were in some respects flexible. The electrical arrangements at a central station were absolutely simple. The part in which there was any complication was the accumulator portion. Accumulators, if used for storing, were in first cost very expensive as compared with gasholders; and if used as regulators, they involved some little complexity in connections and switches. With proper arrangements on the premises for repairing defective plates, the maintenance of accumulators would give very little trouble. Accumulators were specially suitable for water power, because they allowed of the power being utilized during the whole 24 hours. There was a loss of about 24 per cent. of energy in accumulators.

In the discussion upon the papers, Mr. T. de Courcy Meade said the order of procedure with electric lighting in Londonderry had been the reverse of that adopted with most of the English towns. In England, the usual practice had been to adopt electricity for private lighting, and not to undertake public lighting. With regard to Mr. Perry's paper, he did not think any ordinary municipal engineer was likely to undertake an installation of electric lighting without the assistance and advice of an electrical engineer. Mr. Pritchard said it would be interesting to know why Londonderry had gone in for public

lighting alone. Mr. J. Lobley also thought the light should be supplied to private consumers. In the first six months' working at Hanley, they earned sufficient to meet all expenses, including interest on capital and sinking-fund charges. Mr. Christie, in reply, said he thought it would have been better for Londonderry to have worked up the public and private lighting together on a small scale, and extended them as it became necessary.

THE IRON INDUSTRIES AND MINERAL RESOURCES OF SOUTH STAFFORDSHIRE.

At the recent Annual Meeting of the Iron and Steel Institute in Birmingham, under the presidency of Sir D. DALE, the above subjects were dealt with in papers by Mr. D. Jones, F.G.S., and Mr. H. W. Hughes, F.G.S., respectively.

Mr. Jones began by pointing out that many of the inventions which have developed the iron trade to its present position had their home in South Staffordshire; and, after referring to the early history of the trade when iron was smelted with charcoal, and to subsequent inventions, he said that in 1796, there were in South Staffordshire 14 blast-furnaces; in 1806, 40 furnaces, of which 30 were blowing; in 1823, there were in blast 81; in 1826, 90; in 1830, 118; in 1840, 116 in blast. In 1857 this number had been increased to 153 in blast; and since that time a gradual decrease had taken place. On June 30, 1895, they had only 19 in blast. The Iron and Steel Institute visited the district in 1871, when 163 furnaces were built, and 108 in blast. Each furnace produced 6720 tons of iron per annum—the total production being 725,716 tons. Ten years later, the furnaces in blast numbered 48 only; the yield per annum being 7798 tons, and the total production 374,321 tons. In 1891, 31 furnaces were in blast; 11,525 tons was the yield per furnace; and the total production was 357,285 tons. The figures for the subsequent years were: 1892—furnaces built, 27; yield per furnace per annum, 11,956 tons; production, 346,725 tons; 1893—furnaces built, 24; yield per furnace per annum, 13,726 tons; production, 329,431 tons; 1894—furnaces built, 22; yield per furnace per annum, 14,360 tons; production, 315,924 tons.

Turning to manufactured iron, Mr. Jones gave some particulars as to its history, and mentioned that there are upwards of eighty firms in the district engaged in the manufacture of iron in various forms. This statement, however, gave no idea, he said, of the importance of the district in bygone years, when, with South Wales, it produced all the rails used in the world. The principal trade was that of sheet-iron making, associated with galvanizing. Galvanizers had become ironmasters, and ironmasters had become galvanizers. Marked bar iron had been to some extent superseded by steel. During the last ten years, great changes had taken place. Many of the iron-works had been broken up. Having given a list of the puddling and other furnaces and rolling-mills in operation or available in South Staffordshire and East Worcestershire on June 30, 1895, he said some idea of the gradual decrease in the number of furnaces might be formed when he stated that in 1871 there were 2037 erected; while in 1881 the production of puddled iron was 580,000 tons, as compared with 389,013 tons in 1894.

In viewing the district as a metallurgic centre, Mr. Jones said it was necessary to consider the production of steel together with that of iron. Referring to the exceptional position in which South Staffordshire stood in relation to a home market, he said that there was no ironmaking district in Great Britain so surrounded by what he might call the "allied trades." These had sprung into existence from very ancient times—attracted to the locality by the ready supply of fuel. There were generations of clever workers in iron living in the locality, well supplied with the native products of coal and iron. With the increasing needs of civilization, new branches of their industries were developed, and hung around this hive of busy workers. They had gone on extending to the present day. No casual visitor could form the slightest conception of the magnitude and variety of these operations. For many years to come there must of necessity remain for the district a fair future in iron and steel making, if it were only to supply this local hive of industries. He made no comparison between the great and past history of the district and the present for iron producing, nor with the gigantic undertakings in the North of England, South Wales, and Scotland. They had confidence in saying that South Staffordshire was by no means an exhausted district, taken as a whole, and that she had a future within moderate limits for generations to come, arising from her home trade, with which no other iron-making district could compare.

Mr. Hughes, who is the Mining Engineer to the Earl of Dudley, remarked, in his paper dealing with the mineral resources of South Staffordshire, that the coal-field of the district had been compared to an island of Palæozoic rocks surrounded by newer formations on all sides. The general form of the district was that of a rude, irregular, spindle-shaped band, bent so as to have both its sides convex to the west, and terminating in a point both to the north and south. The coal-field differed in its geological structure from the other coal-fields of England, inasmuch as the coal measures reposed directly on the upper Silurian formation; the carboniferous limestone, millstone grit, and Devonian being absent. The Silurian rocks protruded through the overlying strata at Walsall, Dudley, and Sedgley; causing a very distinct line of division in the coal-field. This upheaval of Silurian rocks commenced at Parkfield, south of Wolverhampton; passed through Sedgley to Dudley; and thence to Leasowes by the basaltic Rowley Hills and a steep western slope that ran from them to the south. The line from Parkfield to Dudley formed a broad anticlinal ridge, round which all the coal measures cropped out and took a north-westerly direction, until they turned north of Bilston. For some distance they then ran somewhat parallel with the Bentley fault, until turned in a south-easterly direction by the Walsall Silurian district, against which the coal measures again cropped out, and the Silurian rocks appeared beneath. There was a second ridge of Silurian rocks, first revealed by the sinking of the Heath Pits at West Bromwich, which extended from that point for a distance of at least three miles to the south. In this case, the Silurian rocks did not reach the surface, but were concealed by coal measures. They probably formed an old Silurian bank of rising ground during the coal-measure period. This bank was the boundary of the coal-field until the sinking at Sandwell Park Colliery proved the existence of coal beyond. Recent explorations there had found the existence of a second concealed ridge of Silurian rocks lying at a distance of 1000 yards from the first bank. Its general direction was the same as the former; but its extent had not yet been proved. The author of the paper dealt chiefly with the geological aspect of the question, and described the position and qualities of the coal raised. There was, he said, in conclusion, considerable vitality in the Staffordshire coal-field. The older district, which the Institute visited twenty years ago, was getting worked out; and later developments round the boundaries had brought out a valuable supply of coal. Though the iron production had decreased very considerably, the coal production had practically remained constant for the last thirty years. He felt fairly confident that, given the existence of anything like decent trade, it would remain constant for a considerable time longer. A table was appended to the paper showing the output of coal and ironstone in South Staffordshire from 1873 to 1894. In 1873, the output of coal was 11,100,000 tons; and of ironstone, 346,644 tons. In 1894, the figures were 9,164,543 and 38,550 tons respectively.

THE RARE EARTHS USED IN THE MANTLES FOR INCANDESCENT LIGHTING.

A few months since, an article on "Thorium" was reproduced in the JOURNAL (Vol. LXV., p. 1144) from a German source; and we are now able to present our readers with the substance of two papers that have recently appeared on that and the allied rare metals. One, by Dr. G. P. Drossbach, on the chemistry of the oxides, is from the *Journal für Gasbeleuchtung*; the other, referring more particularly to the sources of thorium, is by Dr. J. W. Ling, of New York, and is translated from the *Chemiker Zeitung*.

The manufacture of mantles according to the Welsbach patents really depends mainly on the admixture of the acid salts of zirconia and thoria with the stongly basic oxides of the cerium group. These latter oxides, of high light-emitting power attract carbonic acid and water from the air, except when in combination with the acid oxides. At the present time, only thorium compounds of the earths found in ytterite appear to be used in the Welsbach mantles. The minerals which for some time have been known to be rich in these earths are thorite, orangite, aeschinite, thorogummite, gadolinite, and ytterite; and as these have now been found more or less plentifully distributed, they have recently been again used for the production of the earths. The text-book analyses of these minerals are quite unreliable, probably because no satisfactory methods for the quantitative separation of the rare earths have been published.

Commercial thorite of the present time contains from 20 to 40 per cent. of thorium oxide; but a mineral passing by that name which contains only 5 to 6 per cent. also comes on the market. It is therefore customary for dealings to be made on the basis of the percentage of thoria it contains. Generally, aeschinite contains up to 16 per cent. of thorium oxide; gadolinite, 6 per cent.; ytterite, 2 to 5 per cent.; and orthite, only 0·6 to 2·0 per cent. Monazite is found in limited quantities in Norway, where it contains 4·9 per cent. of thoria; but rich stores of it have been discovered in Brazil and other places. The working up of it is, however, difficult, on account of its complex composition and small content of thoria. Brazilian monazite contains about 60 to 70 per cent. of oxides of the cerium group, from 0·5 to 1·5 per cent. of thoria, and a considerable amount of the oxides of the yttrium group of metals. But, as Gray has pointed out, nodules of richer monazite are found.

The Brazilian monazite appears to be almost exclusively used for the Welsbach mantles. The other varieties are worked up with difficulty, and the earths are obtained from them at greater cost. Recently, however, a large-grained Australian sand containing 4 to 8 per cent. of thoria, has been freely bought, as it is readily worked up. It contains orangite, which is easily extracted with hydrochloric acid. The Brazilian monazite is in

amber-coloured gravel-like grains, mixed with 10 to 20 per cent. of the original bed in which it was deposited. This consists of speckled gneiss, of which the portions detached by gradual disintegration form the material from which monazite is won. This material contains 0·5 to 2 per cent. of monazite, which is obtained by washing away the lighter particles. The greater portion of this monazite finds its way to the Welsbach factory at Atzgersdorf, near Vienna; only a small proportion being taken by other firms.

There is a prevalent notion that the Welsbach mantles consist wholly of thoria. In the first place, it may be said that those of the other Welsbach companies differ not inconsiderably from the Austrian. Apart from the suspension of the mantle from the side, the Vienna productions have a faint, but unmistakable, salmon colour when cold; while their radiation is incomparably more brilliant that that, for instance, of the Berlin mantles. In the latter, about half the mantle hangs down over the mouth of the burner, and is not raised to incandescence; while the support of the Vienna mantles by platinum wire enables them to be adjusted above the burner. It becomes necessary to strengthen the upper part of the mantle where it is supported by the platinum wire; and therefore only the lower part should be taken for analyses.

Thorium oxide is soluble in carbonates, and is not thrown down by dilution or by addition of ammonia. About 8 to 10 per cent. of a Vienna Welsbach mantle is insoluble in carbonates; and therefore at least this percentage is not thoria. But a number of oxides of the cerium group of metals are also soluble in like manner; and these oxides are found in considerable quantity in monazite. Therefore it is improbable that the 90 per cent. that is soluble is thoria; and terbium especially may be suspected to be present in some quantity. Pure thoria, on account of its absolute resistance to fire, and the absence of any tendency to frit, forms a very stiff mantle; but terbium oxide and other oxides of the group, when added to it, enhance the brilliancy of the incandescence, correct the tint, and give elasticity and durability to the mantle. According to Dr. Auer von Welsbach, there is no limit to the possible modifications of the tint. Mr. M'Kean states that the best result is obtained with 30 per cent. of the oxides of the erbium-yttrium group. This is the reason why a thorium nitrate containing terbium and yttrium is preferred to the pure substance, and is indeed taken for the latter by the uninitiated.

The thorium earth purified according to Bunsen's method by repeated crystallization and precipitation gives, according to him, neither an absorption nor emission spectrum; but Thalen ascribes lines of eight definite wave-lengths to it—some belonging to the known, and some to the, as yet, unisolated components of the group. A pure thorium earth, fulfilling Bunsen's requirements, can, according to Lecoq de Boisbaudran, only be obtained from the commercial earth by repeated recrystallization of the sulphate, and final precipitation with the oxide of one of the heavy metals. According to this method, the commercial substance has a percentage of only 80 to 85.

Thorium nitrate being now an article of commerce much in demand, a few hints for its valuation may be given here. The pure salt crystallizes colourless, and becomes white on drying. A faint yellow colour of it or its solution is unimportant if due to traces of organic bodies; but if iron oxide, uranium oxide, cerium oxide, &c., are the cause, the preparation is unsuitable for use. The pure nitrate should not give a coloration with sulphuretted hydrogen, nor with ammonium sulphide when in solution in alkaline carbonates. It is completely soluble in excess of carbonate, and is not thrown out of solution by ammonia or by dilution. On warming, the solution becomes cloudy through separation of the hydroxide, which, however, dissolves again on addition of ammonia. The nitrate crystallizing with 12 molecules of water gives on ignition 37·95 per cent. of thoria. The same salt dried at 100° C. contains 4 molecules of water, and yields on ignition 47·84 per cent. of pure white thoria. More water may be removed from the salt by drying at a higher temperature; but there is risk of the formation of difficultly soluble basic salts. If the salt with 4 molecules of water gives a residue of more than 47·8 on ignition, it may be concluded that it is contaminated with earths of lower molecular weight. A commercial product yielding 49·2 per cent. of residue on ignition contained 5 per cent. of yttrium and erbium nitrates. This might have been expected, as a mixture of equal quantities of these two salts gave 68 per cent. of residue on ignition. In default of any exact method of separation, the oxides of the yttrium group are estimated indirectly by a molecular weight determination.

The solubility of thorium hydrate in carbonates is not, in itself, a criterion of purity, as has already been pointed out, as the oxides of the yttrium group also have this property. The slightly basic character of thoria renders it easy of recognition qualitatively, though the quantitative analysis is not capable of being carried out very exactly. It is always possible to identify the products from different sources; and therefore it is surprising that, in a dispute, the expert should state that such analyses could not be made. The very dilute solution of thoria which is to be tested is fractionally precipitated with ammonia, so that only about eight-tenths of the oxides present are thrown down; and the precipitate is kept in contact with the liquid in the cold for about ten hours with constant agitation. The whole of the oxides of the yttrium group then remain in solution, if they do not exceed 10 per cent. of the mixed oxides. On concentrating the filtrate, the absorption lines of erbium and its allied metals usually may be found, and often also the broad band near D indicative of didymium. Erbium and the allied metals show distinctly a broad faint band between E and *b*, four fine sharp lines nearer *b*, two bands right and left of the solar line $\lambda = 4860$, and two broad sharp lines right and left of the solar line C. Yttrium, ytterbium, scandium, and terbium can be recognized in the flame spectrum. After the separation of thorium by Lecoq's method, and the precipitation of cerium by that of Popp, addition of ammonia to the residual solution throws down the whole of the oxides of the yttrium group. Zirconium is distinguished from all the other oxides of the group by the solubility of its hydrofluoride in water.

On analyzing mantles that have been in use for some time, the filtrate from the precipitation with ammonia often has a blue tint, from the presence of copper, which presumably is derived from the burner. In the methods of testing given above, no account is taken of contamination with the better-known oxides.

The sudden demand which arose a few years since for thorium nitrate, which hitherto had been merely a laboratory curiosity, seemed likely to be in excess of the supply; and the price rose to more than £45 per pound last year. It has, however, now fallen to a third of that price, owing to the discovery of more of the raw material and the rivalry of manufacturers. Of the raw materials, thorite, which contains thorium as silicate, and monazite sand in which it exists as phosphate, are the best available minerals. But, as already pointed out, thorite varies greatly in richness; and some almost valueless ores have reached the market. Monazite sand is rich in cerium and the allied earths; but it may be considered good if it contains 3 to 4 per cent. of thoria. Mr. R. J. Gray has already described the occurrence and properties of the sand.* But the analysis is attended with difficulties to the chemist who has not had special experience of it; and many comparatively valueless lots of ore have been purchased through misleading analyses. In reality, it is safer to rely on the results of the working up of 20 to 50 lbs. of the sand as carried out on the manufacturing scale, as some sand which is shown by analysis to be tolerably rich in thorium cannot be worked up profitably. The methods adopted by the manufacturers are, for the most part, kept secret, but are based on the solubility of thorium oxalate in boiling solution of ammonium oxalate, in which the oxalates of the cerium group of metals are insoluble. The oxalate is used as an intermediate product in the production of the nitrate, and is now made in America and exported to Europe for the manufacture of the nitrate. The oxalate is converted into the nitrate by forming the sulphate, and throwing down the hydrate, which is readily soluble in nitric acid.

The thorium preparations of commerce vary considerably as far as their content of thoria is concerned, owing to variations in the amount of water they contain. The anyhydrous nitrate contains 55 per cent. of thorium oxide; but the evaporation of a solution of the nitrate cannot be effected without partial decomposition of the salt to oxide before all the water of crystallization is removed. The commercial nitrate contains 47 to 49 per cent. of thoria, which is estimated by igniting the nitrate in a platinum crucible. It is necessary that thorium nitrate for incandescent mantles should be free from iron and alkali; the former affecting the quality of the light, and the latter the durability of the mantle. A mantle made from pure thorium nitrate gives a clear bluish, but feeble light; and other oxides must be mixed with it to give a high emitting power. The broken and discarded mantles have a certain value, on account of their content of thorium; and actually some are being again worked up. The future of the thorium market is obscure; and prices may again reach their former maximum when the demand increases during the winter months. With the rise of new companies, the consumption of thoria will increase; and though it seems doubtful if impregnating the filaments of electric glow lamps with this oxide will ever be successful, there is a prospect of a greatly increased demand setting in shortly.

Dr. G. P. Drossbach promises to give shortly some information on the composition of the mantles of the competing systems.

Gas Undertakings Parliamentary Returns.—In the House of Commons on Wednesday last, the usual annual returns were presented by Mr. Burt, as ordered last May, of gas undertakings in the hands of companies and corporations throughout the United Kingdom. The returns were ordered to be printed, and will be issued in due course; but this will not probably occur till quite late in the year.

Private Bill Legislation.—Of the 168 Private Bills, apart from Provisional Orders, which were promoted during the past session, 103 successfully passed both Houses, and received the Royal Assent, 12 of them were withdrawn, 18 remain suspended till next session, and less than a dozen have been rejected by Committees of both Houses. Among the suspended Bills which will be taken up next session at the stage which they have now reached, are those of the London County Council for the transfer of the water undertakings.

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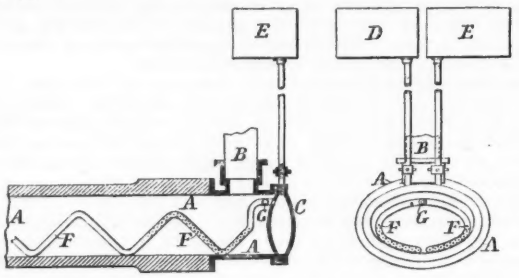
* See JOURNAL, Vol. LXV., p. 1144.

REGISTER OF PATENTS.

Manufacture of Gas.—M'Ewen, T. G., of Leytonstone, Essex No. 8974; May 5, 1894.

According to this invention, water and petroleum or other oil or fat (or, it may be, tar) are exposed to heat together in a closed vessel so as to produce permanent gas. The proportion of water may be varied from one-sixth to one-half or more according to the quality of the oil employed—the former proportion for a very light oil, and the latter for fat or tar.



A longitudinal section of the retort, and a front view with the door removed, are shown in the illustration.

A is the retort; and B, the pipe leading gas from it (of any ordinary pattern). C is the door, made hollow, and secured in any usual way. D and E are tanks supplying water and oil through the pipes to the inside of the hollow door. Screw couplings connect the supply pipes to nozzles on the door, so that the latter can be opened to fill and empty the retort. F are perforated ziz-zag pipes in the retort, connected to a short horizontal pipe G, having a conical end fitting into a corresponding seat in the door. When the door has become hot, oil and water are together admitted to it from the tanks D E; and the resulting vapours pass by the pipe G into the perforated pipes F, where they are further heated. The gas produced escapes through perforations in the pipes F into the retort and pass away through the pipe B.

Prepayment Meters.—Sutherland, A. G., of Kennington Park, S.E. No. 8981; May 7, 1894.

In carrying out this invention in connection with (preferably) an ordinary type of dry gas-meter a barrel or drum is carried upon a crank spindle, and bears a scale upon its periphery visible through an opening in the case or gallery plate, so as to show the amount of gas to be consumed for one payment. The drum revolves during the whole time that the meter is working and gas passing. A toothed wheel, loose upon the crank spindle and concentric with the drum, is caused by frictional contact, obtained by a spring or cone, or its equivalent, to revolve with the drum. Upon the same spindle, or concentric therewith, there is a suitable arrangement of links terminating in inclined caliber points, which can be set nearer to, or farther from, one another so as to decrease or increase the space through which (or through part of which) an arm—also concentrically carried, and having a spring-controlled or weighted pawl to engage with the teeth of the wheel—reciprocates. The caliber links may be operated in any convenient manner—say, by toggle links and a screw and nut; the screw being arranged to be operated from outside the case or gallery plate by passing a screw-driver through a hole in the case and thus turning the grooved head of the screw.

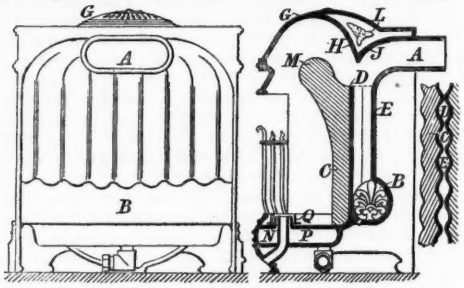
The coin is inserted through a slot in the case or gallery plate. It falls on to a cradle, hung pendulum-wise (but in a horizontal plane) within the case, and operated by a draw-bar or knob outside the case, so arranged as to cover the slot when in its normal position of disuse. When it is desired to obtain gas, the handle is pulled forward, uncovering the slot; and the coin inserted falls into the cradle. The knob is then pushed back, and the coin engages with a portion of the cradle-frame, which is thus caused to move by the coin. The cradle frame is by any suitable means—say, for instance, a pin and slot—connected with the pawl-carrying arm; and the pawl being in engagement with the toothed wheel as the cradle frame is moved, the pawl is moved and carries the wheel round with it, until the pawl is disengaged from the wheel by the operation of the caliber points. This movement of the wheel effects the opening of the gas-supply valve, so that the supply of gas is now on.

The valve-operating mechanism may be of any suitable construction; but the patentee says he has obtained satisfactory results by employing a bar connected with the valve-operating arm. This bar passes through a fixed guide, and carries on its end a projecting portion, which engages with a recess in the toothed wheel. When the projection is in the recess in the wheel, the valve is closed and no gas passes. But when the wheel is rotated by the pawl, the recess in the wheel with which the end of the arm is in engagement, turns with the wheel, drawing the arm with it, and thus opening the supply-valve. Ultimately it is moved from the end of the arm, which, having an inclined face (or the recess having an inclined face), the two parts disengage, and the arm is retained upon the face of the wheel, holding the valve in its open position. The arm is so shaped, or provided with a stop, that when drawn out to its full limit, and raised upon the face of the wheel, the stop prevents its returning until, upon the return of the wheel, the projection upon the arm entering the recess, the stop is released, and as the wheel turns back, the valve is closed.

After performing its function, the coin drops out of the cradle into the receptacle provided for it; and the cradle and frame being hung upon the same centre or axis, the coin operates the frame truly throughout its whole travel. Should a halfpenny (say) be inserted instead of a penny, it will engage with a portion of the frame, so arranged or placed that the movement of the draw-bar, or handle, will only move the pawl, and consequently the toothed wheel, through a distance one-half that which it would receive had a penny been inserted. Consequently, the wheel will return to its normal position in half the time that it would had a penny been inserted.

Gas Fires or Stoves.—Wilson, J. J., of Edinburgh. No. 18,382; Sept. 28, 1894.

The chief features of this invention consist in the construction and arrangement of a gas fireplace or stove, designed "to obviate or minimize the excessive loss of heat invariably carried off with the products of combustion or heated waste gases from gas-fires, so as to utilize most of the heat generated for the purpose of more effectually heating the apartment, without prejudicially affecting the passage or escape of the products of combustion into the flue or chimney."



The invention is particularly applicable to cast-iron stoves, having refractory incandescent fuel-lumps or fret-work, and an ordinary fire-clay back or slab. The flue nozzle A is, by preference, of a curved elongated shape, and cast integral with the back of the stove. In order to draw in a supply of air from the lower back part of the stove (near the floor), so as to control the excessive draught of the flue, the back C of the stove is formed with a number of corrugations integral with the casing, against which is placed a corrugated sheet of metal D, and a correspondingly corrugated sheet of metal E. The sheets are made with the ridges of both corrugated portions D and E impinging against each other, so as to form a series of vertical tubular air-passages which act as one passage. The passages are in communication with a horizontal air chamber B, arranged near the bottom of the stove, and extending from side to side; the ends of the air chamber being formed with openings or perforations, which may, if desired, be provided with regulating shutters.

The top ends of the passages are in communication with the flue nozzle A, which is located horizontally at the back of the stove. The top of the stove is provided with a canopy G, under the back of which, and above the flue nozzle A, are two curved baffle-plates H J, for the purpose of dividing the flue in a slightly descending manner into two passages—the one communicating directly with the induct passage, and the other indirectly with the combustion chamber or flue of the fire. The foregoing arrangement protects the fire and the Bunsen burners from any down-draught of the main flue or chimney.

The chief object of the lower induct passage is to cause an overpowering action on the draught of the flue or chimney, and to divert, by means of the baffle-plates H J, in a direct manner, the draught action of the flue or chimney up the induct passages, which become heated so as to induce a current action other than that of the main flue or chimney. Also from the action of this current passing the junction where the baffle-plates intersect, there is an extracting power exerted sufficient only to draw the heated waste gases of unconsumed carbon up the main flue or chimney, without carrying away the excessive heat.

The curved baffle-plates may be of sheet iron, bolted or screwed to the stove casing; but they are preferably cast integral with the top of the stove, in which case the space L between the underside of the top G of the stove and the tops of the baffle-plates is cored, so as to form a recessed air-heating chamber L, having perforations through the top of the stove, for the purpose of circulating heated air. The ends of the air chamber are also perforated, and have a cover or earlip (preferably of a semicircular shape) for preventing any direct or horizontal current, and to create an induct current of heated air from the chamber. The fire-brick slab M may be of a tubular form at the top, for the purpose of enabling a cylindrical air-heating chamber to be inserted so as to pass from side to side of the stove. The tail ends of the chamber extend downwards at the back of the slab, and so form an air-passage to circulate heated air.

There are a series of atmospheric burners to heat the incandescent fuel, connected to the central or inner air-tubes N, so as to form the series of burners through the bottom P of the mixing chamber. The tubes are secured in their proper positions by long screws with lock nuts; and the tubes are led, by a series of elbow-jointed air-tubes, under the mixing chamber and near to the front of the stove as shown. The op parts of the central tubes are formed with feathered ribs, divided so as to equalize an equal annular space, and by so doing form the Argand Bunsen jet.

Retort Mouthpieces and Self-Sealing Lids.—Mitton, J. L. and T. J. L., of Longwood. No. 19,293; Oct. 11, 1894.

The object aimed at in this arrangement of retort mouthpiece and lid is "to prevent the tar passing out of the retort into the mouthpiece from getting to the joint between the mouthpiece and the lid, and to effectually seal such joint so that no gases can escape from the retort."

Fig. 1 is an elevation in perspective of a retort mouthpiece and self-sealing lid (the lid being shown open). Fig. 2 is a transverse section of the retort with the lid closed. Figs. 3 and 4 are enlarged sectional details of a portion of the mouthpiece and lid, showing slight modifications.

In figs. 1 and 2, A represents the retort-mouthpiece secured in the ordinary manner to the retort B supported in the brick setting C. The body of the mouthpiece, or the lower portion of it, is constructed at an angle to the retort; so that it inclines downwards, as shown in fig. 2. This tends to prevent the tar which passes out of the retort into the mouthpiece from reaching the joint between it and the lid D, or

lodging in the mouthpiece—the tar on entering the mouthpiece being run back again into the retort, whereby very little, if any, is allowed to get as far as the lid.

Fig. 1.

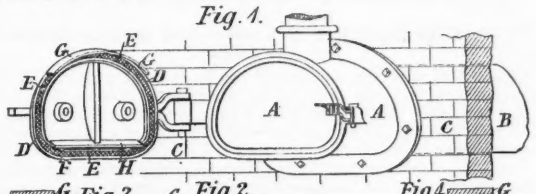


Fig. 3.

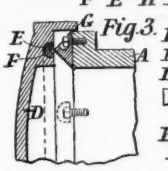


Fig. 2.

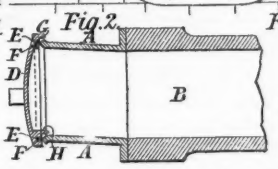
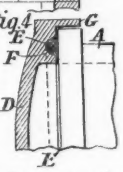


Fig. 4.



To make the lid D self-sealing, a packing ring E of asbestos or other incombustible material is inserted tightly into a recess F formed all round the inner face of the lid. The asbestos may, if desired, be wrapped around a metal ring adapted to fit into the groove F, and be secured therein by screws; but, for ordinary purposes, the ring is dispensed with. The front end of the mouthpiece is provided with a V-shaped or tapered seating, the centre or tapered edge of which coincides with the centre of the asbestos ring, which, when the lid is closed against the mouthpiece and secured thereto, is slightly indented by the V-seating. The asbestos sealing bed gives and takes to the expansion and contraction of the metal lid and mouthpiece; and thus it is claimed that, under all conditions, it maintains a tight joint, and effectually prevents the escape of gases from the retort.

For existing mouthpieces, or those made with a straight or flat face, a V-shaped or knife-edged ring is employed, of the same size and shape as the mouthpiece, to which it is secured by bolts or screws as in fig. 3. If, however, the V-seating is not required, additional packing E is inserted into the groove F so that it projects beyond, and may be flattened against, the face of the lid, as in fig. 4; but the patentees prefer to employ the V-seating, "as there is less surface on which tar can lodge, and therefore less liability of an imperfect joint being made by an accumulation of tar on the seating."

In all cases where two or more retorts are set one above the other, there is attached on the top of the mouthpiece A, of the lower retorts, a protecting plate G, which, when the lid is closed, projects over the joint made between it and the mouthpiece, and shields it from the tar which may fall from the mouthpiece immediately above. A plate H is also formed on, or attached to, the inner face of the lid A, just above the joint made between it and the bottom of the mouthpiece, for the purpose of preventing the tar which boils up into the mouthpiece and against the lid from getting to this part of the joint.

Gas-Stove Flues.—Atkins, J., of Malvern. No. 20,866; Oct. 31, 1894.

The patentee states that the objects of his "invention" are to so construct and arrange the flues of stoves and fires burning coal gas that an upward draught may be set up in the chimneys prior to lighting the stove or fire; also to prevent or minimize the effect of down-draught in the flues of gas-stoves and gas-fires during windy weather.

He arranges in the chimney into which the flue of the gas-stove opens, and just above the level of the top of the stove, a chamber heated by a small gas-flame. This chamber is provided with a glazed door at front for gaining access to the burner for lighting. The pipe from the stove passes through the bottom of this chamber, and terminates near its top. An upper pipe, which virtually constitutes a continuation of the lower one, extends from the top of the chamber to a height of from 3 to 6 feet in the chimney. The top of the upper pipe is preferably provided with a cap for preventing the entrance of dirt and dust into the air-heating chamber. "By heating the small chamber in the chimney prior to lighting the gas stove or fire, a draught is set up in the flue and chimney, which ensures the passage up the chimney of the noxious gases or products of combustion of the gas stove or fire when lighted."

Device for Balancing Chandeliers.—Winfields Limited and Abbott, A., of Birmingham. No. 5686; March 19, 1895.

The object of this invention is to dispense with the ordinary suspending weights and chains of the usual centre-light or gasalier; and to provide a system of support for such a centre-light, so as "to allow the light to be raised and lowered at will, and left in any particular position, while also permitting the light to be moved around a considerable circle." The claims for the invention are: 1. A centre-light suspending and balancing device, in which the light is suspended from a tube attached to hinging arms; the arms being pivoted from a centre tube, and sustained by springs contained within pivoted telescopic tubular cases, connected at the top to the centre tube, and below to the hinging arms. 2. A centre-light suspending and balancing device, in which the light is suspended from a tube attached to hinging arms; the arms being pivoted from a centre tube, and sustained by a spring device attached to the centre tube—the spring device consisting of an enclosed spring (such as a circular spring) attached at one end to the outer tube, and at the other end to a rotating disc—having a curved cam surface cut upon it, upon which a wire, flat band, or chain operates, so as to equalize the pull of the spring, and produce a uniform effect on the arms to which the other end of the wire, band, or chain is attached.

Production of Gas from Oil.—Merichenski, M., of Forest Gate, Essex, and Moffat, J. D., of Victoria Street, S.W. No. 8120; April 24, 1895.

The object of this invention is to construct apparatus "for the production of inflammable gas from hydrocarbon oil, for lighting and heating purposes, with incandescent or other burners, and for use in motive power engines." The patentees propose to use one or more vessels, mounted one above the other; each vessel being preferably cylindrical, and divided by vertical internal walls or partitions, so as to form involute and evolute or spiral passages, channels, or chambers. These chambers are filled with absorbent material—such as pith, sponge, and the like—capable of receiving and holding in suspension, by capillary attraction or otherwise, a quantity of hydrocarbon oil. Air is caused to travel through the passages formed in the vessels, whereby it becomes saturated with inflammable vapour by contact with the oil in the absorbent material; and the charged air is afterwards carried to the burners, or other ordinary appliances for utilizing it.

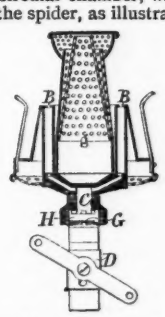
Radiant Tissue for Lamps.—Crocker, S. H., of Holborn. No. 9506; May 14, 1895.

The patentee proposes to take a quantity of paper pulp in a semi-liquid state, and mix therewith a sufficient quantity of zirconia or other rare metallic combination known to resist volatilization by heat. To the paper pulp may also be added a small quantity of starch, to facilitate its conversion into sheets, as hereafter referred to. The composition so formed is allowed to dry or harden to a suitable degree; and is then formed into sheets, which are perforated with holes of any desired shape or size, and thereby produce "a finely reticulated area of material, capable of being rendered radiant or incandescent by heat."

Perforated sheets are obtained from the composition by two methods—viz., firstly, by forming the composition into sheets, and then perforating them by mechanical appliances; or, secondly, by forming the sheet with the required number of holes or spaces throughout its area. To obtain the sheet in this latter form, the patentee first takes a piece of perforated water-proof paper, sheet metal, or other material, and coats the surface with the composition in its liquid state—preferably by pouring it upon the perforated sheet after the well-known method of paper making, and allowing it to drain and dry. When the coating applied is thin in substance and the perforations sufficiently large, the coating will not extend over the whole area of the perforated sheet; but some of the liquid composition will fall through the perforations. Hence the sheet will be formed of the composition resembling the perforated sheet on which it has been deposited. Sheets made from this composition of refractory and cellulose materials are consolidated by pressing, rolling, or other suitable means, and then cut into any required shape. They may be used either in a flat state, or curved and joined together so as to form hollow truncated cones, made up into hollow pyramids, or "in any other regular or irregular figure suitable for the economic application of heat for producing the required incandescence."

Gas-Burners.—Upton, C. S., of New York. No. 10,546; May 28, 1895.

The illustration shows a side view (partially in central vertical section) of an Argand gas-burner of this self-regulating form. The burner consists preferably of a circular chamber—provided at the top with the flame-orifices B—in communication at the bottom with the gas-passage C, by passages formed in the legs of an annular frame, on which rests the piece forming a circular chamber. The spider is so constructed as to leave free passage by the legs thereof into the central portion of the burner, so as to feed the inner mantle of the flame with air, which is distributed equally to all parts of the inner mantle of the flame, by being first compelled to pass through a perforated thimble or air-distributor supported within the central air-passage of the burner in any desired manner. The air to feed the outer mantle of the flame is equally distributed by passing through perforations in the chimney-gallery, and in the upward extension thereof, as well as through a perforated air-distributing bottom-plate, which closes the space lying between the outer edge of the downwardly extending outer flange of the chimney-gallery and the outer wall of the circular chamber, where such wall is secured to the annular portion of the spider, as illustrated.



The parts being in the position shown, and gas being admitted to the passage C by the stop-cock D, it will be found that the force of the stream of gas will in such case be just sufficient to lift the regulating disc G slightly away from the bottom of the disc-chamber H, so as to allow the gas to escape from underneath and around the edges between the studs, and up through the passage through the stud of the spider, and through the passages and annular chamber to the flame orifices B. If now the pressure of the gas be increased sufficiently to cause the flame of an ordinary burner to hiss, such increase of pressure will at once serve to instantly drive the mica disc G up tight against the top of the disc-chamber H, when the gas can only pass to the flame-orifices B through the grooves or perforations provided for it; and inasmuch as these perforations are of such size as to permit of only sufficient gas to keep the flame burning properly to pass to the orifices under the extremest of gas service pressures, blowing and hissing of the flame will be prevented.

Incandescent Tissue for Gas-Lamps.—Crocker, S. H., of Furnival Street, London. No. 13,111; July 6, 1895.

In making an incandescent gas-mantle according to this invention, the patentee proposes to first construct a truncated conical frame or

support consisting of an upper and a lower ring of thin iron wire connected together by straight wires or ribs disposed at equal distances all round. To these wires or ribs are attached short strips of the material from which the illuminating portion of the mantle is to be formed; the strips being arranged one above the other regularly from the bottom to the top of each rib, and at right angles or tranversely thereto—the strips of one rib being so disposed that they come opposite the spaces between those of the adjacent ribs, and the finished mantle having a polygonal form, the strips of each rib forming one side of the polygon. The mantle thus built up is then subjected to the burning operation; the heat being applied somewhat gradually at first, and free access of air being allowed in order that the iron wires of the frame may become converted into ferric oxide before the full heat is applied. They thus retain their shape, and serve to support the refractory illuminating material left by the burning of the strips cemented to them.

The cement employed for fastening the strips to the wire frame, or to each other, consists "of any adhesive substance which, when burnt, will leave a residue capable of holding together the parts to be connected without injuriously affecting them or impairing their refractory properties." This substance may be mixed with some of the compounds used for the illuminating portion of the mantle. The cement preferred consists "of a mixture of dextrin and nitrate of zirconium brought to a suitable consistency by water to allow it to be conveniently applied to the parts to be joined together."

The material employed for forming the incandescent portion of the mantle consists of a special paper, which during the process of manufacture has been "loaded" with oxide of zirconium or other refractory incandescent compounds such as are employed in incandescent mantles, in place of the kaolin or other substance generally used for loading paper. By this means the incandescent compound becomes incorporated with the substance of the paper; and the latter can be readily cut into strips for the purpose of building up the mantles.

APPLICATIONS FOR LETTERS PATENT.

15,991.—GABE, H., "Automatical apparatus for decomposing carbide of calcium." Aug. 26.

16,007.—FORD, T., "Chandeliers, gaseliers, gas-pendants, and gas-brackets." Aug. 26.

16,036.—PERKINS, A. B., "Water-service valves and other similar valves." Aug. 27.

16,060.—PAASCH, H., "Liquid and gaseous meters; also applicable for other purposes." Aug. 27.

16,079.—BRIGGS, F. H., "Gas and oil engines or motors." Aug. 27.

16,110.—VIVIAN, F. G. "Carburetted water-gas plant." Aug. 28.

16,129.—POINTON, J., "An improved method of making illuminating gas; applicable also to the production of hydrocarbon oil and ammonia, and apparatus therefor." Aug. 28.

16,139.—LAYCOCK, J., "Apparatus for washing and scrubbing gas." Aug. 28.

16,144.—OLDFIELD, J. K., "Water-waste preventers." Aug. 28.

16,178.—FLETCHER, T., RUSSELL, W., and FLETCHER, RUSSELL, AND Co., LIMITED, "Reflector gas-stoves." Aug. 29.

16,183.—SALOMONS, Sir D. S., and BAILEY, F., "Apparatus for straining water." Aug. 29.

16,255.—TWEEDDALE, J., "Apparatus for regulating the pressure of water in pipes." Aug. 30.

16,271.—GLOVER, R. T. and J. G., "Coin-freed gas-meters." Aug. 30.

16,272.—PERLICH, A., "Lamp for the production of spirit-gas incandescent light, with lighting and extinguishing contrivance." Aug. 30.

16,295.—M'LAREN, W. S. B., and CARROD, H., "Apparatus for purifying and softening water." Aug. 30.

16,308.—SLEEN, N. V., and SCHNELLER, A., "Apparatus for the sterilization and purification of water." Aug. 30.

16,323.—BUTLER, W. C., "Gas-stove for heating and cooking purposes." Aug. 31.

16,327.—MORTON, J., and SHADBOLT, R. G., "Kilns for burning fire-bricks, retorts, &c." Aug. 31.

16,370.—SMITH, C., "Coin-freed gas and other fluid meters." A communication from L. P. V. Madsen. Aug. 31.

The Price of Gas for Public Purposes at Armagh.—The Directors of the Armagh Gas Company have notified to the Town Commissioners that they have resolved to allow them a reduction in the price of gas 2d. per 1000 cubic feet.

Carrickfergus Gas Supply.—The improvements commenced at the Carrickfergus Gas-Works a few weeks ago have now been completed; and the result will be a better supply of gas to the town. An important item was the re-sheeting of the gasholder, which was very much worn, and the strengthening of it by the addition of six columns. This work has been satisfactorily completed by Messrs. R. & J. Dempster, of Manchester. Recently the Directors of the Company have relaid large portions of the mains through the town; and it is the intention to carry the work still further. It is also intended to erect a number of new lamps in different parts of the town and suburbs, where more light is much required.

Sales of Shares.—Last Thursday, Mr. A. Gibson offered for sale by public auction at Sunderland, 1000 £5 shares in the *Sunderland Gas Company*, being part of the additional capital authorized to be issued by their Act of 1867, the maximum dividend on which is 8½ per cent. There was a numerous attendance of buyers. The prices produced ranged from £10 5s. to £10 10s. per share; but only 30 went at the former figure. The sale realized about £10,500.——On Tuesday, 33 shares in the *Spalding Water Company* realized £10 12s. 6d. to £11 5s. each. The dividend last year was was 6 per cent.; and the shares were sold *cum* dividend, which is payable this month.——Twenty-four £10 shares (£6 paid up) in the *Bridlington Quay Water Company* have recently been sold by auction at £17 5s. to £19 each.——At Preston last week, Mr. G. Wrightson sold by auction, £80 of consolidated "A" stock in the *Preston Gas Company* for £159.——Some fully-paid £5 shares in the *Golborne Gas Company, Limited*, realized by auction last week, £6 16s. 6d. and £6 17s.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Need for Regulation of Consumption in Incandescent Gas-Burners.

SIR,—Following the particulars you have been giving of incandescent lighting, you may like to make use of the enclosed tables of experiments made for this Company by Mr. Leicester Greville, which point the warning for gas companies that any excess consumption in an incandescent burner is to a large extent lost, as the light produced per cubic foot of gas burnt falls in an increasing ratio, more especially with the second type—viz., without transparent chimney.

H. E. JONES.

Commercial Gas Company, Stepney, Sept. 6, 1895.

[ENCLOSURES.]

Tests of Incandescent Gas-Burner.

Pattern—Without chimney, but with glass vase and metal upper chimney.

Pressure.	Cubic Feet per Hour.	Candle Light.	Candle Light per Cubic Foot of Gas.
7-10ths	3·30	42·0	12·7
10-10ths	3·80	53·0	14·0
15-10ths	4·75	41·0	8·6
20-10ths	5·55	34·4	6·2
25-10ths	6·25	30·5	4·8

These figures show that the best result is obtained at 10-10ths pressure with a gas consumption of 3·8 feet per hour. Also that beyond this limit *increased* gas consumption is accompanied with *diminished* light.

The difference at 10-10ths and 25-10ths pressure is an *increased* gas consumption of 64 per cent., and a *decreased* illumination of 66 per cent.

H. LEICESTER GREVILLE, F.I.C., &c.

May, 1895.

Tests of "C" Incandescent Burner.

Pattern—Ordinary type, with mica chimney.

Pressure.	Gas Consumption. Cubic Feet per Hour.	Light in Candles.	Light in Candles per Cubic Foot.
7-10ths	3·2	52·0	16·2
10-10ths	3·8	56·0	14·7
15-10ths	4·5	55·0	12·2
20-10ths	5·5	49·0	9·0
25-10ths	6·1	45·5	7·4

These results show an increase of 60 per cent. gas consumption, and a decrease of 49·7 per cent. light for an increased pressure of from 10-10ths to 25-10ths.

H. LEICESTER GREVILLE, F.I.C., &c.

August, 1895.

The Standard of Light Committee's Report.

SIR,—It cannot be said that the Commission has succeeded in simplifying the confusion that was said to exist in the measurement of light. While not wishing to disparage the services of a pentane lamp as a relative means of comparison, it seems to me that we are given only another to the two excellent instruments that we already have in general use—viz., the jet photometer and the Methven's screen.

Why does the Commission cling to the declaration of candle power, and then offer a standard which is two removes from what it standardizes? It is quite evident that if the Commission were able, by the use of candles, to obtain a standard figure of their value, the body of gas examiners in the country are able to use the candles as successfully in determining by them the value of the gas. So that a roundabout method is superfluous.

Why should not candles be made of an exact composition, and with a standard number and size of wicks; and why should they not be used in one general way? The conditions under which candles give variable results are now well known. No gas examiner of knowledge and experience is led into error by the candles *per se;* the faults arise mainly from inexperience and inattention. Such faults will affect results by any standard, however simple it may be made.

In my experience, I have always found that candles from one maker will give consistent results; but when another maker's candles are used, there is frequently a difference in the results. This brings me to the opinion that if rigorous care were taken by a central authority—such as the Board of Trade—in issuing candles for experimental purposes sealed and certified, much of the trouble of former days, which brought candles into disfavour, would be obviated.

I respectfully submit that further consideration be given to this important question before action is taken for London gas-testing, which will not prove useful or acceptable for the Provinces.

E. WILLIAMS, F.C.S.

Manchester, Sept. 6, 1895.

"Cannon" Stoves.

SIR,—In your issue of the 27th ult., we notice your report of Mr. Siemens's paper on the subject of "Illuminating Gas for Heating Purposes;" and in two places reference is made in inverted commas to "Cannon" stoves. Of course, we are aware that this refers to the make of coal fires by slow combustion; but the word "Cannon" may be misunderstood as referring to ourselves. Our trade mark is the word "Cannon;" it has been in use for about 70 years, and is duly registered. It is our exclusive property, and is not in use by any other firm in our line of business, nor can it be so used.

We trust you will insert this explanation in your next issue.

THE "CANNON" HOLLOWWARE CO., LTD.

Sept. 6, 1895.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Monday, Sept. 2.

WATER SUPPLY IN THE METROPOLIS.

On the motion of Sir A. ROLLIT, a return was ordered showing, as regards each Water Company supplying water in the Metropolis, (*a*) the name of each Metropolitan parish where the supply throughout the parish is constant; (*b*) the name of each Metropolitan parish where the supply is constant only in part of the parish, and, in the case of each such parish, a description of the part of the parish where the supply is constant; (*c*) with respect to each parish, at whose instance the constant supply was ordered or given; (*d*) the name of each Metropolitan parish where the supply throughout the parish is intermittent; (*e*) the name of each Metropolitan parish where the supply is intermittent only in part of the parish, and, in the case of each such parish, a description of the part of the parish where the supply is intermittent; and (*f*) with respect to each parish or part of a parish where the supply is intermittent, the period during which water is supplied daily to the premises of consumers.

HOUSE OF LORDS COMMITTEE.

(*Before the Earl of* JERSEY, *Chairman; Earl* GREY, *the Earl of* DARTMOUTH, *Lord* CALTHORPE, *and Lord* KENRY.)

BARNSLEY CORPORATION WATER BILL.

The Bill promoted by the Barnsley Corporation in the last Parliament, for the purpose of obtaining power to procure a new source of water supply, was inquired into by the above Committee. The application was very vigorously opposed by parties interested in the watershed proposed to be acquired; but, as already announced in the JOURNAL, the Committee passed the Bill, which is now suspended, and stands for second reading in the House of Commons.

Mr. POPE, Q.C., Mr. PEMBER, Q.C., Mr. PAGE, and Sir G. MORRISON appeared for the promoters. The various opponents were represented as follows: The Corporation of Sheffield, by Mr. LITTLER, Q.C., Mr. BALFOUR BROWNE, Q.C., and Mr. G. FITZGERALD; the Corporation of Wakefield, by Mr. FREEMAN; the Duke of Norfolk, by Mr. POLLOCK, Q.C., and Mr. LEWIS COWARD; Messrs. S. Fox and Co, Limited, by Mr. WORSLEY TAYLOR, Q.C., and Mr. READER HARRIS, Q.C.; the Wakefield Rural District Council, by Mr. J. D. FITZGERALD; the Corporation of Doncaster, by Mr. WORSLEY TAYLOR, Q.C., and Mr. RAM; the Corporation of Rotherham, by Mr. BIDDER, Q.C., and Mr. BAGGALLAY; the owners, lessees, and occupiers of the mills and works on the Rivers Don and Little Don, by Mr. BAGGALLAY; the owners, lessees, and occupiers of steam-engine works and property on the River Don, by Mr. CRIPPS, Q.C., and Mr. J. D. FITZGERALD; and the West Riding County Council and the West Riding of Yorkshire Rivers Board, by Mr. PEMBROKE STEPHENS, Q.C., and Mr. MOON.

Mr. POPE, in opening the case, said the borough of Barnsley sought to construct additional water-works in order to supply the pressing needs of the borough for a further supply of good water. The increase of Barnsley in the last thirty years had been about 98 per cent. of the population; the town had, in fact, nearly doubled itself. With the exception of Rotherham, whose boundaries had been extended, the rate of increase in the other large towns in the neighbourhood had not been so large as in Barnsley—not even in Sheffield. Sheffield opposed the Bill rather on the principle that they wanted the water, or might in some remote future want it, for themselves. The works proposed to be constructed were on the Little Don River—a tributary of the larger River Don, which passed through Sheffield and Rotherham, and on to Doncaster. They hoped to give Barnsley an admirable supply to meet the necessities of the next fifteen or twenty years. Sheffield had existing reservoirs; and they had also certain authorized reservoirs which they had not yet constructed. His answer to the objection of Sheffield was that they would not require a further supply for a long time to come, because they had unexhausted powers to construct water-works which would serve them for at least as long as the works that Barnsley now sought power to carry out; and, further, that Barnsley was only going to do what practically Sheffield had already done—viz., ask for powers to carry them over the next fifteen or twenty years. Barnsley only wished to acquire 2000 acres of the ground, which would still leave 8000 acres to Sheffield. Dealing with the petition of the Corporation of that town, he pointed out that the population of Sheffield at the present time was 402,000, and the present works were sufficient to supply it. The Corporation's reserve power, added to their present resources, would give them a supply of 20 gallons per head for a population of 700,000, and 25 gallons per head for 600,000. They had consequently a sufficient supply for a population nearly 50 per cent. in excess of the present one. Sheffield was only increasing by 1½ per cent. a year; so that in truth they had water enough for at least twenty or thirty years to come. In their petition, Sheffield objected to the Barnsley Corporation taking water from the watershed of the River Don; and Counsel contended that Barnsley was as much within the drainage area of that river as, and was three or four miles nearer to it than, Sheffield. The petition also stated that below Sheffield, in the valley of the Don, there were the important towns of Rotherham, with a population of 46,000, and Doncaster, with a population of 26,000, and various mining and manufacturing centres and rural and urban districts. Both Sheffield and all those towns and districts were entitled to look to the sources of the Don for a further supply of water for drinking and other purposes, and would be injuriously affected if the waters of the Little Don were diverted from flowing into the River Don. Counsel, however, contended that Barnsley was as much in the valley of the Don as any of the other towns and districts mentioned in the petition, and was therefore entitled to as much regard, as far as its interests were concerned, as was Sheffield or Rotherham, or any of the other places. Barnsley had a rising and growing community; and they claimed a fair share of the water, which might, they acknowledged, be part of the source of supply of those various interests. Counsel then dealt with the other petitions against the Bill, which were mainly put in by riparian owners on the River Don, including the Duke of Norfolk, who sought compensation for any damage to their interests that might arise by the carrying out of the proposed works.

Evidence was then called in support of the Bill.

Alderman *E. Raley*, the Chairman of the Water Committee of the Barnsley Corporation, described the industries of the town, which, he said, was a growing one; the population having increased from 17,000 in 1861 to 40,000 now. The present works were designed by the late Mr. Hawksley in 1862 to supply a population of 50,000. The present daily consumption was about 1,014,000 gallons—nearly the limit, which was 1,080,000 gallons. The total population of Barnsley and of the out-townships now supplied by the Corporation was from 68,000 to 70,000. The out-townships at present served were too small to construct works for themselves. In exceptional droughts in 1884, 1887, and 1893, the supply ran very short; and the borough was subjected to great inconvenience and loss. The Corporation entered into an agreement with Dewsbury by which they obtained an increased supply of 46 million gallons, at a cost of £1400. Without this they could not have served their district. They also obtained the consent of the Sheffield millowners to forego their compensation water; and they entered into an agreement with Penistone for a supply of their water. This convinced them that it was necessary to obtain an additional source. They therefore consulted Mr. Charles Hawksley, who designed the present scheme, by which it was proposed to impound some 2000 acres of the Little Don drainage area, and to form a reservoir, as well as to extend the limit of supply to the places at present served—Ardsley, Monk Bretton, Worsborough, Stainborough, and Royston—as well as to Carleton, Hemsworth, Shafton, South Hiendley, South Kirkby, Notton, Woolley, and South Elmsall. The local authorities of all these places had repeatedly expressed their desire to be included in the Bill.

Mr. BIDDER cross-examined witness on behalf of Rotherham, to show that Barnsley was proposing, for purposes of profit, to include places with which it had no connection; and to take power to supply not merely sufficient for the wants of Barnsley, but for an unlimited district. Witness admitted that this practically was so. He said the Corporation sought to obtain a supply, and to make the best of it. It was also submitted that Barnsley proposed to do this at the expense of Rotherham and Sheffield, for the Don area was the natural gathering-ground to which they looked for an increased supply in the future. Witness, however, maintained that the Don was the natural supply of Barnsley.

In cross-examination on behalf of various opponents, witness stated that he was not aware that a number of authorities such as Wakefield had a good deal of water to sell; nor had he considered what injury the Barnsley scheme might do to the Sheffield district in the Don drainage area. Barnsley had no desire to supply water within the limits of the Wakefield district; but until he had consulted with Counsel, he would not consent to put a clause in the Bill to this effect, unless Wakefield would agree not to enter the Barnsley area of supply. Witness expressed the belief that there would soon be a scarcity of water in Barnsley alone, leaving aside the out-townships.

In re-examination, witness said Barnsley must have water from somewhere. Parliament had already sanctioned the taking of water from the Don; and the Corporation now sought a further supply. Barnsley did not sell to its needy neighbours until it was shown that they were in dire straits. It could not have supplied them had it not been for help from other than their own sources. The Local Authorities Barnsley was to supply under the powers of the Bill had agreed to pay 10d. per 1000 gallons, and were perfectly capable of looking after themselves without the motherly care of the West Riding Council. The enlargement of the Barnsley reservoir would have the same effect on the water obtained by the Sheffield millowners as the proposed works which the Bill would authorize.

Mr. *W. Battye*, of Darley Grove, near Barnsley, said the district was very badly off for water; and the Corporation had come to their rescue. The township had arranged to pay 1s. per 1000 gallons for the water. They had borrowed £5000 altogether for the purpose of paying for the supply, which, on the whole, had been satisfactory. They should regard it as a calamity to be without it.

Other witnesses gave evidence in support of the Bill. One of these—the Vice-Chairman of the Ardsley Urban District Council—was under cross-examination by Mr. Pembroke Stephens, when the learned Counsel was asked if his clients (the West Riding County Council) claimed a right to supervise agreements entered into between the Barnsley Corporation and the Local Authorities.

Mr. PEMBROKE STEPHENS said his contention was that the supply was not a suitable one at present; and supposing this objection were removed, the County Council claimed to put before their Lordships the view that, where a water supply of a district was to be absorbed, the absorption should take place on reasonable and proper terms. If some local districts had made provident arrangements with Barnsley, the Council desired to see that these arrangements were adhered to; but when improvident terms were proposed, they asked their Lordships not to sanction them.

Dr. *Sadler*, the Medical Officer of Health for Barnsley, said in 1893—a year of great drought—the supply of water was limited, and the result was an outbreak of typhoid fever. The water at present supplied was pure and soft; but not so soft as to be dangerous to health through its effect upon lead piping.

In cross-examination by Mr. PEMBROKE STEPHENS, witness said lead-poisoning was well known in the West Riding; but the number of cases had been decreasing of late. Soft water from the moors no doubt had a more or less solvent effect upon lead; but the Barnsley water was treated with lime.

Mr. *J. H. Taylor*, the Borough Surveyor of Barnsley, and the Manager of the water-works, in answer to questions by Sir G. MORRISON, gave particulars as to the source of supply, the charges made to the consumers, and the reasons for promoting the Bill. He said the total

population of the district proposed to be supplied was 94,692, including 10,000 persons outside, whom they were not desirous of serving, but whom they would supply because of their pipes being laid down through the districts containing this population of 10,000. There was, however, a supply for 7000 of these people already existing; and the actual population the promoters would be called upon to serve would be 87,000. The Midhope scheme would supply this population with 20 gallons per head per day, and would meet the wants of the district for the next 22 or 23 years. The Midhope water would be taken from a gathering-ground where there was only one house standing; while on the gathering-ground of the Ingbirchworth reservoir, some 160 persons resided. He thought the Midhope water was better than that obtained from Ingbirchworth. Any serious deterioration in the quality of the water would cause some manufacturers to send their work elsewhere. He might mention that a large bleacher and dyer had told him that any other water would have an injurious effect upon his printing, as the colours would not come out bright enough with hard water; and if there was any change, he would have to send his trade away. He described the filtering apparatus in use at the water-works, and stated that the last two filters erected by himself had been successful in neutralizing the tendency of the water to act upon lead. There was great necessity for an increased supply.

Mr. BIDDER cross-examined witness with the view of showing that if the Corporation ceased to supply the out-townships, which they were under no obligation to serve, they would have plenty of water for their own purposes; and, further, that the rate they charged the out-districts left a large profit. In fact, he said his case to their Lordships would be that the Bill was promoted not for Barnsley's own necessities, but in order to carry on still further a speculation in the sale of water which had been found highly lucrative.

In reply to Mr. BALFOUR BROWNE, witness said the Barnsley Corporation at one time contemplated omitting the out-districts; but he denied that, if they had done this, the supply would be adequate for the wants of the area they were at present bound to supply, which comprised a population of 48,000.

Mr. BALFOUR BROWNE: But even at 20 gallons per head per day, your scheme would serve for a population of 180,000. Including the out-townships, you do not expect the population to increase to that extent?

Witness said they did not think Parliament would require them to throw overboard the out-townships. Practically, the population of their existing limit of supply was 87,000; and at the present rate of progress, they anticipated that in 1917 or 1918 Ingbirchworth and Midhope together would only be sufficient to supply 20 gallons per head per day.

In answer to Mr. READER HARRIS, witness said he had tried to do his best; but he had reluctantly come to the conclusion that the Midhope scheme was the only available one. He scouted the idea of raising the height of the Ingbirchworth reservoir embankment. Such a thing, he said, had never entered his head. He was urged to add 12 inches to the height of the bye-wash. But the suggestion was a foolish one; and he declined to carry it out. It would endanger the embankment; and he did not think the watershed would supply water enough in a dry season. As to pumping from the sandstone, the water was fit for neither man nor beast.

Replying to Mr. MOON, witness said the Barnsley Corporation were quite willing to allow any of the out-townships they now supplied to avail themselves of another source of supply.

Mr. MOON: But are you not compelling Ingbirchworth to take your supply?

Witness: Yes; but there were exceptional circumstances.

Mr. POPE inquired what a County Council had to do with any bargain a District Council might make.

Mr. PEMBROKE STEPHENS, while admitting that the County Council had nothing to do with a bargain, said they could and ought to interfere generally to prevent such terms being imposed as would fetter other districts which had not at present made one.

After a long argument,

The CHAIRMAN said the question was: Which is the water authority of a district—the District Council or the County Council? Unless the learned Counsel could show any Act giving them a supervising control over the matter of the agreements, it was not worth while pursuing the cross-examination any farther.

Mr. *C. Hawksley*, M.Inst.C.E., the Engineer of the scheme, in answer to Mr. POPE, said the present water-works at Barnsley were completed in 1868. The drainage area at Ingbirchworth comprised 1857 acres. In estimating the requirements of the district, they ought not to calculate on less than 20 gallons per head per day. In Sheffield, the supply was from 19 to 20 gallons per head per day. The works proposed to be carried out under the Bill would supply the needs of a population of 135,000 persons. It would take five years from the present time to construct the works; and at the end of 22 years an additional supply would be necessary. By the Bill it was proposed to take water from the drainage area of the Little Don, which embraced the Hogg Brook and Thickwood's Brook, two tributaries of the river. The water would first be filtered in beds constructed in the neighbourhood of the reservoir, and would then be conveyed by pipes to a service reservoir at Wortley. Another line of pipes would take the water to Barnsley, and would supply on the way townships desiring to have the water. The drainage area it was proposed to take was 1922 acres. The total drainage area of the Little Don was about 11,000 acres.

Mr. POPE: What is the drainage area of the River Don above Sheffield?

Witness: About 85,000 acres. Up to the junction of the two boroughs of Sheffield and Rotherham, it is 102,000 acres.

So that it is a very small proportion of the drainage area of the Don that you propose to take?—Very small.

And on the Don you leave abundant drainage area and sites for the construction of reservoirs?—Certainly. There are on the Little Don 9000 acres of drainage area containing sites for reservoirs. Of this we only take 1922 acres.

What is the rainfall of the area you propose to take?—The total rainfall is 43½ inches; but the available rainfall is only 21 inches. The water obtained from the proposed works added to that from the present works would give a supply of 2,700,000 gallons a day.

In regard to the petition of Sheffield, What are the existing circumstances of that borough in reference to their water supply?—The works for their existing supply consist of three reservoirs known as the Redmires reservoirs, two others known as the Rivelin reservoirs, four others in the Loxley valley, the Strines reservoir, the Dale Dyke reservoir, the Agden reservoir, and the Damflask reservoir, the construction of which has just been completed. Other reservoirs have been authorized in the Ewden Valley; but these have not yet been commenced. The Corporation acquired the land for them; but they have not finished them because they have not been required by the needs of the borough. The Bill authorizing the construction of these reservoirs was obtained in 1867.

About what power have they now to supply the population of Sheffield with 25 gallons of water per head per day?—Allowing that quantity of water, they would need not only the reservoirs already in use, but also the Damflask reservoir. They are therefore now left with the Ewden watershed. That is capable of giving a supply to a further population of 200,000. The present population supplied is 402,000; and it is increasing at the rate of 1½ per cent. per annum.

That would give Sheffield a supply for 24 years in advance?—Yes. I do not think Sheffield will be in Parliament for new works for 20 years.

It is clear to you that the wants of Barnsley are immediately urgent; and it would be rather hard on her to say she shall not have what she needs because Sheffield will want some more water in 24 years?—I think it would.

With regard to Rotherham, Have they a Bill before Parliament?—Yes. It is for obtaining water by means of wells to be sunk in their own district.

Questioned as to the petition of Messrs. Fox and Co., witness said one-third of the available rainfall was a fair amount of compensation water, and was more beneficial to the millowners and others on the rivers than the whole rainfall descending irregularly—too little at one time, and far too much at another. There was no more danger of the proposed new reservoir bursting than there was of any other reservoir giving way; and there was a good deal less danger in this case than in that of some reservoirs. The foundation on which this reservoir would be placed was particularly well suited for the purpose. The water in the reservoir would be 100 feet deep; and the embankment would be 105 feet deep.

Mr. CRIPPS, on behalf of millowners and occupiers on the River Don, cross-examined witness as to the suggested alternative scheme of constructing additional reservoirs at Ingbirchworth.

Mr. POPE objected, on the ground that the matter was not raised in the petition.

Mr. CRIPPS said his object was to show that there was no necessity for Barnsley to go to the watershed of the Little Don.

The Committee overruled the objection.

Witness said his late father considered the possibility of keeping all the water in the Ingbirchworth reservoir for the purposes of supply, and sending the compensation water down from the Scout Dyke reservoir. Witness did not think it would be desirable to heighten the embankment of the Ingbirchworth reservoir. Barnsley was in the same watershed as Sheffield, if they took the whole watershed of the River Don; but they were in separate watersheds if they subdivided the watershed. He admitted that not one drop of water that flowed past Sheffield flowed past Barnsley also. The only available scheme for augmenting the water supply of Barnsley was the Midhope scheme. It only proposed to include some 2000 acres of the drainage area of the upper part of the Little Don; leaving nearly 100,000 acres of the drainage area of the Little Don and Don Rivers to Sheffield, with abundant sites for the formation of reservoirs.

In cross-examination by Mr. BIDDER, witness said he was aware that Rotherham was in difficulties as to its water supply; but they had a Bill before Parliament which proposed to increase it by pumping from the wells in the neighbourhood. He had heard that a large portion of the existing supply on which the population depended had been condemned by a report of the Local Government Board.

Mr. BIDDER: If we found ourselves face to face with a great and sudden necessity, owing to the report of the Local Government Board, it would be right that we should do everything we could to increase the supply temporarily until we could get something permanent.

Witness: Yes, no doubt; and that is what Barnsley is doing at the present time.

Do you suggest to their Lordships that in our Bill we are only taking pumping powers, and do not propose to go to the watershed of the Little Don?—I do.

Do you know the Bill contained a clause asking for powers expressly to make an investigation of the watershed of the Little Don, with a view to obtaining an additional supply of water? That clause was put in after it was known that the Barnsley Corporation were going to the watershed of the Little Don. The clause was struck out by the Standing Orders Committee.

Have you any ground for making the suggestion that it was because of your Bill that we developed that intention? It is a serious charge to make?—I believe that, if the dates of the proceedings are looked at, the suggestion will be borne out. Further, I think that the very form of the application to Parliament—the very unusual form, that the watershed might be shut out from everybody for a period of ten years while the Corporation of Rotherham are making up their minds what they shall do—is in itself *primâ facie* evidence that it was thought of at the last moment.

Do you know that the clause went out at the instance of the Sheffield Corporation, in consequence of negotiations with the Rotherham Corporation?—No. I am informed that it went out on the direction of the Standing Orders Committee.

Are you aware of the fact that, since this Bill has been deposited, the Sheffield, Rotherham, and Doncaster authorities have approached each other for a common scheme to go to the watershed of the Little Don, and that, in consequence, the application in the Rotherham Bill was withdrawn?—I am not aware of that. I did not know there had been such an arrangement. I am aware that the Corporation of Rotherham struggled very hard before the Examiners to retain the clause.

In answer to Mr. BALFOUR BROWNE, witness said that, as a matter of

principle, it was not fair for a town to go into another valley, so long as the valley it was in was still unexhausted—always provided that other things were equal; and therefore it became incumbent upon the Barnsley Corporation to show that they could not, from their own valley, get sufficient water of reasonable purity. A reservoir to hold 377 million gallons could be constructed on the Scout Dyke. With regard to Sheffield, he had already stated that the town would not require more water for a period of 27 years; and, to allow for contingencies, the Corporation ought to apply to Parliament seven years before the expiration of that time.

Mr. BALFOUR BROWNE: That gives us twenty years from now, even if we have no calls upon us. Where are we to go in twenty years?

Witness: That would be a consideration at the end of twenty years.

No; it is a consideration to-day.—There will be other sources. Sheffield will be a large place then, with 600,000 inhabitants; and I dare say it will have an ambition equal to that of Liverpool and Manchester, and go farther afield for water.

Why should we go farther afield when we have the watershed of the Little Don?—It is a question for the consideration of the Committee whether or not this valley is to lie idle for 27 years in order that Sheffield might go there if it thought proper at the end of that period. You must remember that we are leaving 7000 acres untouched.

Mr. *J. Mansergh*, M.Inst.C.E., next gave evidence in support of the Bill. He said he was familiar with both the Barnsley and the Sheffield Water-Works, and also with the watershed of the Little Don. With regard to the scheme in the present Bill, he could support it from an engineering point of view. The site for the reservoir was all that could be desired with a view to the safety of the bank. With respect to the opposition of the Sheffield Corporation, he pointed out that thirty years ago Sheffield obtained powers over the watershed of the Ewden Brook, from which source they could get something like five million gallons of water. This would be a supply for an additional 200,000 people, and for even a larger population if they did not use more water per head than they were doing now.

Mr. *G. J. Symons*, F.R.S., Secretary of the Royal Meteorological Society, was next called. He said the mean rainfall of the gathering-ground of the proposed new reservoir was 44 inches. He deducted one-fifth, in order to take exceptionally dry weather into account; and this made the rainfall 35·2 inches. From that they had to deduct between 14 and 14½ inches lost by evaporation and percolation. This left the total available rainfall of the gathering-ground at 21 inches, as near as possible. In manufacturing districts, where considerable water power was utilized, it had been the practice of Parliament to give one-third of the total available rainfall as compensation water. In this case, the one-third would amount to 7 inches, which he thought would be ample.

Mr. *R. Carter*, a former Mayor of Barnsley, expressed the opinion that the scheme in the Bill would furnish the town with a very satisfactory supply of water.

Mr. *H. Rofe*, M.Inst.C.E., also gave evidence in favour of the scheme. He said he did not think any responsible engineer would undertake to give Barnsley more water by means of the suggested augmentation of the supply from the Ingbirchworth reservoir.

Mr. *Hawksley*, recalled, stated that his figure of £150,000 as the cost of the proposed works did not include filter-beds, which would involve an additional outlay of £12,000; making a total of £162,000.

Mr. *Taylor* was also recalled, and said the population outside the existing area of supply, whether taking water or not, was 23,445. This was the actual population outside the area.

Professor *J. Dewar*, F.R.S., said he had on several occasions examined and analyzed the waters in the district from which the promoters of the Bill were proposing to take their additional supply. He had prosecuted his investigations on behalf of the Corporations of Sheffield and Bradford, mostly with regard to the effect of the water upon lead. His main inquiries for those two towns had reference to lead-poisoning, and to the remedial agents to be employed to prevent its effects. The whole of the waters in the district attracted lead more or less, according to the season and the condition of the supply. Sheffield experienced the same difficulty; but a remedy had been successfully applied there which could be employed at Barnsley and in other places. There was absolutely no difficulty in dealing with the action of the water upon lead. He considered the proposed Midhope watershed the most suitable one that could be selected in the district. It contained but a small proportion of arable land; and there was less land in cultivation—only 2 per cent.—whereas in the other districts the minimum was 20 per cent. Scout Dyke, for instance, contained 20 per cent. of land under cultivation; and, what was more objectionable, it was manured by night soil taken from Barnsley and the neighbourhood. No one would select a watershed that was highly polluted with manure; and no chemist would advise such a district to be used as a watershed. The district selected by the promoters was entirely free from impurities.

In cross-examination by Mr. PEMBROKE STEPHENS, witness said the waters in the district were of remarkable property. Anyone who introduced the water for the purposes of public supply must realize that it required to be specially dealt with—filtered or treated by some method. There was no filtration at Sheffield; but the water was passed through finely-divided chalk in running into the reservoir, and this diminished the action of the lead. Water of this kind, if filtered or treated by chalk, as at Sheffield, could be easily adapted for the purpose of a public supply.

Mr. PEMBROKE STEPHENS: If the water is sent down to the main in a perfectly harmless state, might it not be rendered dangerous by passing through lead pipes into the houses?

Witness: I cannot go the length of saying that. If the water were to lie in lead cisterns, it would be highly dangerous; but I will not go so far as to say that the short run through a lead pipe into a house would do any harm.

If there is to be treatment of the water, do you agree that a constant supply would be the safest on the whole?—Yes; that is my opinion.

Do you know that the Bill contemplates not a constant, but an intermittent supply?—I have not gone into that question.

Then your evidence is that the water is dangerous?—Not at all. It is perfectly harmless when treated as I suggest.

What is your remedy?—Filter it, if you cannot treat it with chalk, as at Sheffield.

But who is to filter it?—The Corporation.

Who is to make the Corporation filter the water?—I cannot conceive, after my experience of the Corporations of Sheffield and Bradford, any Corporation taking this water without providing for filtering it. Sheffield does not require to do this, for the reasons I have mentioned; but Barnsley would filter, if the conditions there were less favourable than those at Sheffield.

Mr. *Mammatt*, a mining engineer, said his opinion was that Barnsley would go on improving as a mining centre; there being in the neighbourhood coal-fields which would yield coal for fifty or sixty years. Under these circumstances, the importance of a proper water supply for the district must be obvious to everybody.

Mr. *A. H. Green*, examined by Mr. POPE, said he was Professor of Geology at Christ Church, Oxford, and had been acquainted for the past thirty years with the district from which the proposed water supply was to be taken. He had examined the site selected for the Midhope reservoir; and he could safely say that he had never seen one possessing so many favourable conditions.

Mr. POPE said he had several other witnesses; but their evidence would only go to corroborate what had already been put before their Lordships in support of the Bill.

The case for the promoters then closed. The further proceedings on the Bill will be reported in a subsequent issue.

LEGAL INTELLIGENCE.

Abstracting Money from Prepayment Meters.

At the Lambeth Police Court on Monday last week, John Dowling, aged 18, a labourer, was charged before Mr. Hopkins with attempting to steal money from an automatic prepayment gas-meter at No. 274, Camberwell New Road, the property of the South Metropolitan Gas Company. The occupiers of the house are supplied with gas by a prepayment meter; and just before four o'clock on Sunday morning a police-constable was passing along the road, when he heard a slight noise in the area of No. 274. He crept into the front garden, and found the prisoner in the area. When asked what he was doing there, the prisoner admitted that he was trying to open the gas-meter in order to get the money out. The meter had been wrenched away from the wall and the gas was escaping. Mr. Underwood, an official of the Company, informed his Worship that this class of offence was on the increase. There had been four cases within the previous few weeks. Mr. Hopkins remanded the prisoner for inquiries.

Public Lighting by Gas at Ainsdale.—By order of the Parish Council of Ainsdale, the streets in the district were illuminated for the first time by means of gas on the night of Saturday, the 31st ult. An agreement has been entered into with the Southport Corporation, the scheme to cost the ratepayers of Ainsdale £50 per annum, to meet which a rate of 3d. in the pound on houses and similar property, and 1d. in the pound on land will be levied. The inaugural ceremony of lighting the first lamp was performed by Mr. C. Nesbitt, the Chairman of the Parish Council.

The Water Question at Gomersal.—At last Wednesday's meeting of the Gomersal District Council, Mr. Brearley reported upon an interview with the Water Committee of the Bradford Corporation. He said they laid before the Committee the history of the negotiations with the Gomersal Water Company with a view to the purchase of the plant for the ratepayers, and stated that, while the sum of £10,000 was asked for the Company's plant and interest, the Corporation had themselves purchased the whole of the plant in Liversedge, which was three times as large as Gomersal, for a little above £3000. They also pointed out that the charges for water in Gomersal were something like twice as high, and in some cases three times as high, as in the neighbouring district. The deputation asked that the Committee should become mediators between the Company and the District Council; and if they could not do this, then that the Corporation should supply the district with water separately from the Company, or otherwise leave the ratepayers to "work out their own salvation" in their own way. The Committee expressed considerable sympathy with them; but as to what passed precisely, he thought it would not be wise to report further in public. The deputation suggested that the question should be adjourned for the present.

Trades Unionists and an Eight-Hour Day.—At the Trades Union Congress at Cardiff last Wednesday, Mr. W. Thorne, the General Secretary of the Gas Workers' and General Labourers' Union, moved the following resolution: "Seeing that the eight-hour working day is one of the most important preliminary steps toward the ultimate emancipation of the working class, and will lessen the number of unemployed, improve the quality of work, and increase the health, strength, and intelligence of the workers, this Congress declares that the time has arrived when the hours of labour should be limited to eight per day in all trades and occupations (miners excepted) in the United Kingdom, and that the Parliamentary Committee be instructed to draft a Bill on the lines of this resolution with a view of getting it passed through Parliament, and made a law of the country." In support of his motion, Mr. Thorne said that all ought to agree to a general eight-hour resolution; the time being fully ripe for such a step. Another reason why the delegates should be unanimous on this subject was the rapid increase of the use of machinery in all industries. More especially was this the case in the gas industry. There were only two ways of getting the hours of labour reduced—by an Act of Parliament, or by coming into conflict with their employers, and spending their money. He, for one, therefore did not see why they should contribute to their organizations, and then spend their money in a strike, when an easier way could be found. Some people advised a general strike. He thought that a general strike would only be entered upon by the workers for the purpose of obtaining complete control of the means and ways of production. The resolution raised a good deal of discussion; but it was carried by a substantial majority.

MISCELLANEOUS NEWS.

THE DVORKOVITZ OIL-GAS ENRICHMENT PROCESS AT BRADFORD.

The Gas Committee Recommend its Abandonment.

The members of the Gas and Electricity Supply Committee of the Bradford Corporation met last Wednesday afternoon to consider the supplementary report of Mr. Lewis T. Wright, the expert called in to advise that body as to the results obtained from the experiments in the oil enrichment of gas by the Dvorkovitz process which have been conducted at the Bradford Gas-Works for some time past. It will be generally known, says the *Bradford Observer*, that the Gas Committee have been divided in opinion on the merits of the system now being tried, both in comparison with the use of cannel for enrichment and with the value of the oxy-oil system which has been in use at Huddersfield. The Chairman of the Gas Committee consulted Mr. Lewis T. Wright some time ago on certain matters concerning the Dvorkovitz system; and afterwards the Committee resolved, in spite of the strong opposition of a minority, to employ Mr. Wright to prepare a report for its guidance. This document was presented to the Committee about a fortnight ago; and Mr. Wright was then asked to prepare a supplementary report dealing with certain matters upon which the first report was not sufficiently conclusive. The second document was circulated amongst the members of the Committee a few days since, and formed the basis of the discussion last week. In addition to this supplementary report, however, the Committee had before them a letter from Mr. William Wood, the Gas Engineer, adversely criticizing Mr. Wright's conclusions, and an offer from Mr. Isaac Smith—who has conducted the negotiations with the Corporation in regard to the Dvorkovitz system on behalf of a Syndicate—to allow the Corporation to work the system on terms which, he claimed, would ensure a very large saving, and without any risk. These three communications were discussed with strong feeling; and, upon the whole question, there was as keen a division of opinion as has formerly been the case. At an early stage of the proceedings, it was suggested by the advocates of a further trial of the Dvorkovitz system that Mr. Smith, who was in attendance at the Town Hall, should be brought into the room to make certain explanations. But, by the casting vote of the Chairman (Mr. W. C. Dixon), it was decided not to take that course. Mr. Thomas Speight then moved that the oil-gas process be abandoned; it not having answered the expectations of the Committee. An amendment was moved, to the effect that the proposal from Mr. Smith which was then before the Committee should be accepted. But this was defeated; and, in the absence of several members of the Committee who were known to be favourable to the Dvorkovitz system, the resolution was put to the vote, and carried by 10 votes to 2.

The following are the documents which were before the Committee, the first being the supplementary report of Mr. Wright, the second Mr. Wood's comments thereon, and the third a letter containing the new offer made by Mr. Smith:—

No. 1.

1, *Victoria Street, S.W., Aug.* 28, 1895.

To the Chairman of the Gas and Electricity Supply Committee, Bradford.

Sir,—At the request of your Committee, as expressed at the meeting of the 21st inst., I have carefully studied the question of cannel enrichment under the conditions actually obtaining in Bradford; and, bearing in mind Mr. Wood's opinion, that the coke from cannels cannot be successfully employed in the retort-furnaces as now installed at Bradford, I have arrived at the conclusion that it is quite easy for the Bradford Corporation to procure ample supplies of cannels from the Yorkshire, Derbyshire, and Nottingham coalfields that will give enrichment at the figure I verbally made.

I append an estimate based upon actual working experience on a large scale—an estimate that brings out the cost of adding 1 candle to the standard illuminating power, as determined by consuming the gas at the rate of 5 cubic feet per hour, at 0·81 of a penny per 1000 cubic feet, by means of cannel yielding 10,000 cubic feet of gas of an enriching illuminating power of 23 candles per 5 cubic feet. I would call your attention to the fact that, in the estimate, the entire product of coke from the cannel is valued at 3s. 4d. per ton; and the coke employed for carbonizing the cannel is charged at 7s. 6d. per ton. This condition is not favourable to the utilization of cannel coal; and I would suggest that in future renewals of the retort-furnaces, they should be so arranged as to consume the cannel coke.

In order to calculate the saving arising on this basis from the use of the Dvorkovitz oil-gas process, I take the standard illuminating power to be supplied at 18¾ candles, and that of the unenriched coal gas at 15¾ candles, per 5 cubic feet respectively. The amount of enrichment required is therefore 3 candles per 5 cubic feet. The difference in cost is 0·81 − 0·76 = 0·05 of a penny per 1000 per candle per 5 cubic feet, or 0·05 × 3 = 0·15 of a penny for the total enrichment required. In the year ending March 31, 1894, the quantity of gas made at Bradford was 1,506,822 thousands; and the saving, therefore, on this basis will be the round sum of £942.

The question of the commercial value of an oil-gas process cannot be dismissed by a simple reference to a saving, whether it be large or small. There is another consideration that your Committee will not ignore; and that is the value of the possession of an alternative enrichment process. But for the introduction of oil-gas processes in their various forms, in view of the foreign demand for the cannels of this country, it is not too much to say that there would be a very great scarcity of this article, with consequent high prices. In the experiment recently carried out at Bradford, the amount of the petroleum gasified was 65 per cent. of the original bulk; and in former trials the amount appears to have varied from as low as 40 per cent. up to 64 per cent. (*Vide* Mr. Charles Wood's report of Jan. 23, 1895.) With so low a proportion of the oil gasified in the retorting process, it is most essential that the residual products should be economically utilized. The oil-gas works in this country serving railway-carriage lighting, in some cases sell the oil-gas tar at from ½d. to ¾d. per gallon, and in other cases consume it as a fuel. This latter use is not generally practicable in towns, as at times it gives rise to smoke which may occasion nuisance. This is evidence that such oil-gas tars are not profitable to make for sale. To employ it in its crude state in a carburetter, as has been done at the Thornton Road works, is not desirable; but it appears to me that a method might be devised by which the same value I obtain—viz., 1·7d. per gallon—could be secured, and without the objections I have had occasion to note. Nor can I recommend your Committee to entertain the idea of attempting to utilize this oil-gas tar (bye-product) by distilling it, and selling the refined, or even partially refined, products. The quantity available, even in the case of the adoption of this oil-gas process to the exclusion of cannel, would not justify the Corporation entering upon such a business that requires special experience, and is attended with considerable expenses, not only for actual expenses in the refinery, but also for carriage of products and for casks.—I am, &c.,

(Signed) LEWIS T. WRIGHT.

Estimate of cost of enrichment at Bradford from cannel coal, yielding 10,000 cubic feet of gas of an enriching illuminating power of 23 candles per 5 cubic feet:—

Net cost of cannel per ton.

	Pence per Ton.		Pence per Ton.
Cannel at 13s. per ton	156·00	Tar, 19·5 gallons at 1·2d. per gallon	23·40
Fuel used in furnaces, 4 cwt. at 7s. 6d. per ton	18·00	Ammoniacal liquor, 23·5 gallons at 0·84d. per gallon	19·74
		Coke, 11·6 cwt. at 3s. 4d. per ton	23·20
	174·00		66·34
	66·34		
Net cost of cannel per ton	107·66		

Cost of gas per 10 0 cubic feet.

	Pence per Thousand.
Net coal as above	10·766
Purification, salaries, wages, repairs, and maintenance. Average of three years ending 1893	6·171
Interest and sinking fund	1·918
	18·855
Less spent oxide	0·226
Cost per 1000 cubic feet into gasholders	18·629

Or 0·81d. per 1000 per candle per 5 cubic feet.

No. 2.

Gas Office, Bradford, Sept. 3, 1895.

To the Chairman and Members of the Gas Committee.

Gentlemen,—Before you come to a decision upon this question, I feel it my duty to submit to you the following statement, which I put as briefly as possible. Any details can be given afterwards.

Mr. Lewis T. Wright stated in a communication which was read to this Committee that the calculated cost of enrichment per candle-thousand in our report of the thirty-three days' test—viz., 0·42d. (page 3), was "incorrect," and that this result must be multiplied by 5, and should be 2·1d. When asked to explain this statement, Mr. Wright wrote declining to discuss the matter except upon payment of a fee. He has since admitted that the result referred to is correctly calculated. Mr. Frank Wright (brother to Mr. L. T. Wright), in an extraordinary report, for which he was paid ten guineas, made a similar misleading statement.

Mr. Wright refused to test the process if worked as it had been during the thirty-three days' test—viz., enriching with oil gas and bye-products at the same time. The difference between Mr. Wright's estimate of 0·76d. and the 0·42d. in the thirty-three days' test is due chiefly to the estimated values of the bye-products. As 6d. per gallon has been offered to the Corporation for these, we valued it at that figure. Mr. Wright's valuation of the bye-products (1·7d. per gallon) was based upon a carburetting experiment of three hours; although, in his opinion, this was not a satisfactory way of working. The photometer tests in this experiment were very conflicting. The bye-products were evaporated much faster than the gas could possibly retain them. Mr. Wright says that, for carburetting, the bye-products should first be distilled. This we recommended in March as being the best method of dealing with them. Mr. Wright's comparison of the bye-products with other oil-gas tars is misleading, as the bye-products obtained at Thornton Road do not at all resemble the tars from other oil-gas processes.

Again, in his first report, Mr. Wright advises distillation of the bye-products; in his second, he states that he cannot recommend this. Mr. Wright bases his estimate of the cost of cannel enrichment upon the use of cannel at 13s. per ton. Although we had half a million tons of cannel offered this year, we could not buy any at this price which would give the quantity and quality of gas, coke, tar, and liquor which Mr. Wright gives. Mr. Wright values the ammoniacal liquor from his cannel at 0·84d. per gallon (*i.e.*, 15s. 3d. per ton of 218½ gallons). The present average price of liquor, as quoted in the JOURNAL OF GAS LIGHTING, is 7s.; and the average price for the last three months is only 7s. 5d. per ton.

Mr. Wright calculates the cost of his cannel enrichment in quite a different way from his oil-gas enrichment when he assumes that the whole of the 23 candles would be available for enriching 15¾-candle coal gas. Taking Mr. Wright's values for the cannel and residuals, if the cost is reckoned out in exactly the same way as he reckons the cost of the oil-gas enrichment, the result would be 0·98d., instead of 0 81d. Mr. Wright states that 17·73-candle gas is worth 13·66d. per 1000 cubic feet in the holders. Therefore, upon the same basis, 18¾-candle gas is worth—

$$13{\cdot}66\text{d.} \times \frac{18\frac{3}{4}}{17{\cdot}73} = 14{\cdot}44\text{d. per 1000 feet.}$$

Therefore, 1000 cubic feet of 23-candle gas cost (Mr. Wright) 18·629d.;

and if 1000 cubic feet of 18¾-candle gas are worth 14·44d., then the extra 4¼ candles cost 4·18d. per 1000 feet, or

$$\frac{4{\cdot}18}{4\frac{1}{4}} = 0{\cdot}98\text{d. per candle per 1000 feet.}$$

Repeated attempts have been made in Bradford to use the cannel coke for our retorts, but always without success; and I am convinced, for several reasons, it would be a great mistake to burn this coke.

In conclusion, I am of opinion that the Dvorkovitz process, in regular working, will cost less, and that cannel enrichment (at present prices) will cost more, than Mr. Wright's estimates; and that, therefore, by the adoption of the process, the saving to the Corporation would be considerably more than Mr. Wright's figures.—I am, &c.,

(Signed) W. Wood.

No. 3.

Bradford, Sept. 4, 1895.

Dear Mr. Town Clerk,—This subject will no doubt come up in Committee again to-day, upon consideration of the further report which I learn Mr. Wright has made; and as I have an offer to put forward, I want the Committee to have it before them at the same time.

You will remember that the agreement made with the Corporation at the outset (dated Aug. 7, 1894) empowers them to take over the plant at their own valuation; and on paying me £150 towards expenses, they have the right to use the process at all the gas-works in the borough. The offer I have to make, then, is as follows: On the Corporation agreeing to work the plant in Thornton Road for six months continuously, and to utilize the bye-products for the same length of time, under directions to be supplied by me, I will allow the £150 to be expended upon additional plant for treating the bye-products, and will guarantee, moreover, that the cost of enrichment shall not then exceed ½d. per candle for every 1000 cubic feet of gas supplied for consumption. Should the cost of enrichment not exceed that figure, then the Corporation to take over the plant at the end of the six months at cost prices.

The above offer means a clear saving at the Thornton Road Gas-Works alone at the rate of more than £1400 per annum on a capital outlay of less than half that amount. If extended to all the gas-works in the town, the saving would amount to more than £6000 per annum on a capital outlay of only £2000, without risk to the Corporation. —I am, &c.

(Signed) Isaac Smith.

The above reports and recommendation will be on the *agenda* of business at to-day's meeting of the Corporation; but it is quite possible that no definite decision will be arrived at. The *Bradford Observer*, writing on this subject last Friday, says: "What with the oil-gas question, the technical instruction grants, and one or two other matters of no less importance, though not causes of such keen controversy as is provoked by these two, there seems to be fair promise of a field-day for the Bradford Town Council next Tuesday. The present state of feeling between the two sections into which the Council is divided on one of these subjects is probably without parallel in the history of Bradford's corporate affairs, during the last twenty years at any rate. There are flat contradicitions in the evidence adduced, not only upon theories, but on the most elementary facts. The members of the Council who are not on the Gas Committee, and upon whose intelligence and judgment the result is to rest, have presumably got the task of, in three or four days, unravelling all this tangle, which is the work of months, so that they may be prepared to vote on Tuesday next. It is said that the voting on Tuesday will display practically a strict division of political parties. If that is so, of course, there is no need whatever for any effort to arrive at the actual and incontrovertible facts. If, on the other hand, the question of the value or uselessness of the oil-gas process is to be decided actually on its merits, would it not be only a reasonable thing that the general body of the councillors should now have all the documents put before them, and be allowed a month for the consideration of the matter? It is stated that amongst some members of the Council who have succeeded in keeping their heads cool during the controversy, there is a strong desire that this course should be taken." The full text of the decision of the Committee reads as follows: "That, after full trial of the apparatus and process patented by Dr. Dvorkovitz for the enrichment of gas by oil, and after careful consideration of reports by Mr. Lewis T. Wright, the expert called in to advise on the matter, the Committee find that the experiment has not proved a success to warrant the adoption of the system by the Corporation, and that the Council be accordingly recommended to abandon the scheme. The Committee, however, desire to acknowledge the kind services rendered by Mr. Isaac Smith in affording to the Corporation all possible assistance in the carrying out of the experiment."

BELFAST CORPORATION GAS SUPPLY.

The Past Year's Working.

At the Monthly Meeting of the Belfast Corporation on Monday last week—the Lord Mayor (Mr. W. M'Cammond, J.P.) presiding—the Gas Committte reported that the accounts for the past year (subject to audit) showed a very satisfactory result. The working of the carburetted water gas has proved most satisfactory; and having regard to the large expenditure going on in connection with the extension of the plant therefor, and for mains, also the money supplied for the electric light installation, the Committee have thought it prudent to charge the cost of the extensions made during the past year to revenue. After meeting such outlay, and adding £2000 to the insurance fund, there remains a balance of £3044 14s. 7d. to the credit of profit and loss, which the Committee recommended should be carried forward to the next account.

Alderman Dixon, in moving the adoption of the report, said the working of the gas department had been very satisfactory during the past year. The consumption of gas had increased by 5 per cent. The water-gas manufacture had been a great success; and the profits of the undertaking generally were more than in the previous year. Undoubtedly Mr. Stelfox, their able Manager, deserved great credit for the ability with which he had administered this important trust.

Mr. Harrison suggested that if the amount of profit from the gas department was so large, the Committee might consider the advisability of giving £1000 to the Library Committee.

Mr. Bell thought the Committee might seriously consider the advisability of lowering the price of gas, as it seemed they would be justified in doing so by the amount of profit realized. If water gas, as stated, were cheaper than ordinary coal gas, it must follow that a large profit was made, of which the consumer ought to get a portion of the direct benefit.

Alderman M'Connell wished to know, in the event of the Corporation going for a Bill in Parliament this year or next, whether the Gas Committee would obtain power to give a supply of gas to all consumers on equal terms, subject to the same rate of discount.

Alderman Haslett asked if the £25,000 lent to the Electric Committee was carried forward as a debt or not.

Alderman Dixon said the sum referred to stood as a debt in the books of the department.

Alderman Haslett said the Corporation had to face the difficulty that the borrowing powers under their Act of Parliament for the gas department were almost run out. At the same time, though he would be disposed to give the Committee every freedom to pay out from the working profits for many things in connection with the extension to the works, he thought the cost of the permanent buildings ought, if possible, to be made out of borrowed capital rather than out of profits. He would be glad also to see the mass of the people benefit by the success of the gas undertaking, and that it should not be solely the large consumers who obtained special advantages. Of course, the original idea was that mills and other places which gave employment to the working population, should be encouraged; but he thought they had arrived at a time when these special arrangements should be done away with. The difficulty was that, in giving a reduction in the price of gas, if they made the reduction, and gave also the rate of discount to those in receipt of it, they would reduce the charge for gas to under cost price, with, of course, disastrous results to the ratepayers. Again they must regard the gas undertaking to some extent as a fickle one; for they did not exactly know what its future might be. With regard to the electric light undertaking, they were glad to see that it competed so favourably with gas; but he was inclined to think that it had not made anything like the same advance as some of the newer forms of gas lighting. They saw, for instance, the incandescent gas-light very rapidly coming to the front; and he must say that some places lighted by this system compared favourably with others lighted by electricity. At the same time, in a sanitary sense, electric lighting was far ahead of any other form.

Mr. M'Cormick said the Corporation were not responsible for the system of discounts allowed consumers. This was an arrangement due to the old Gas Company, which they had to take over with all its "infirmities." He wished to know from the Town Clerk whether it would be necessary to obtain an Act of Parliament before they could do away with the present system of discounts.

The Town Clerk said the discounts were fixed by Act of Parliament; and the Corporation were obliged to allow them. It would thus be necessary to obtain an amending Act to do away with them; but if the Corporation were going for an Act for any other purpose, it would, of course, be easy to put in an amending clause dealing with the matter. He had anticipated the wishes of the Corporation in the matter; and had already brought the subject before the Gas Committee. He was sure it would be easy to make a uniform charge for gas, which would give private consumers the full benefit of the success of the gas development, and yet put millowners and other manufacturers in no worse position than they were at present.

Mr. M'Cormick said there were many manufacturers in town who did not come up to the high percentage required; and, therefore, they obtained no benefit from the discount system. As a fact, they were supplying gas to some people below first cost, and making the remainder supply the profit. This was very unsatisfactory; but he saw no way of meeting the difficulty save that proposed by the Town Clerk. He hoped the Chairman of the Gas Committee would see that a clause was put in the next Bill applied for by the Corporation dealing with this matter.

In reply to Mr. Barklie,

Alderman Dixon said the total amount set aside for insurance was now £9000; and the estimated value of the property was £350,000, irrespective of mains. He hoped they would be able in time to see their way to reduce the price of gas; but it was necessary for them to be very cautious. Oil last year was very cheap, which made a great difference to the price of their water gas; and then there was the electric light competition. He hoped whenever they went for a Bill in Parliament for the Gas Committee, they would take the opportunity of having a clause inserted dealing with the discounts.

The motion for the adoption of the report was then carried.

CARLISLE CORPORATION GAS AND WATER SUPPLY.

The Annual Reports.

Last Wednesday the Gas and Water Committee of the Carlisle Corporation agreed upon their report for the twelve months to June 30, to be submitted in due course to the Town Council.

It states that the consumption of gas during the year increased steadily; the total quantity made being 250,154,000 cubic feet, which, compared with the preceding year, shows an increase of 17,364,000 cubic feet, equal to 7·45 per cent. The gross profit for the year was £8455. It is mentioned that favourable contracts have been entered into for the supply of coal and sale of tar for the ensuing year; but that the market for sulphate of ammonia is very much depressed. The revenue from the sale of water continues to increase; the gross profit being £4706, compared with £4502 in the preceding year.

The Gas and Water Engineer (Mr. C. E. Newton), in his report

to the Committee, says the works under his charge are in excellent condition. The improvements and extensions of the chemical plant, already sanctioned, are to be put in hand immediately. The use of gas for purposes other than lighting—such as cooking, heating, and gas-engines—continues to increase. The coal and cannel carbonized during the year amounted to 23,372 tons; and the average quantity of gas produced per ton of coal, &c., carbonized was 10,703 cubic feet. The average illuminating power of the gas supplied during the year has been 19·36 sperm candles; while the impurities have been kept very low. The number of consumers, based on the number of accounts, is now 7347. The quantity of water supplied during the past two years (ending June 30) is as follows: Quantity pumped in 1894, 375 million gallons; 1895, 397 millions. Supplied for domestic purposes in 1894, 275 million gallons; 1895, 280 millions. Supplied for trade and other purposes in 1894, 100 million gallons; 1895, 116 millions. Average daily supply for all purposes per head of the population in 1894, 23·89 gallons; 1895, 25·32 gallons.

AUSTRALIAN GASLIGHT COMPANY.

Last week's mail from Australia brought particulars of the working of the Australian (Sydney) Gaslight Company for the half year ended June 30.

The Company's accounts are not set out so fully as is general throughout England; the total revenue during the six months, from "sales of gas, &c.," being given, in one amount, as £158,228. The total expenditure and charge is given in three items: Manufacture, distribution of gas, repairs and renewals of plant, management, &c., £92,124; lighting and repairing public lamps, £7001; miscellaneous charges, interest on debentures, bad debts, &c., £10,745. This total of £109,870 leaves an amount of £54,795 (subject to dividend) to be carried to the next account—due allowance having been made for the balance in hand after paying the dividend for the second half of the year 1894.

The general balance-sheet shows that the capital of the Company consists of 113,633 shares, £6 each paid up, or £681,798, with a reserve fund of £110,450. There are sundry creditors, temporary loans, debentures, &c., amounting to £348,000; suspense accounts, £121,415; consumers' deposits, £9098; and reserves for replacement of meters and cookers, £9735. On the assets side of the account, the Company's fixed investment—land, buildings and machinery at the various stations, mains and service pipes laid, implements, and furniture—represents an amount of £1,054,873; and the stores investment—coals, residual products, apparatus in store, meters, lamps, and pillars—a sum of £169,567.

The Directors in their report, submitted at the annual general meeting on July 29, recommended the payment of a dividend of 9s. per share—absorbing £51,135—and carrying forward £3660. It is mentioned that, consequent on the retirement of Mr. W. Johnston, the Directors have appointed Mr. R. J. Lukey (late of Falmouth) Secretary of the Company; and it is also noted that the Engineer, Mr. Thomas J. Bush, "reports that the whole of the Company's plant is in good working order." The Directors decided to reduce the price of gas, as from Aug. 1, by 3d. per 1000 cubic feet (making it 4s. 6d.), and the public lamps 2s. 6d. and 10s. per lamp per annum for the ordinary and eighty-candle power lights respectively. It was further mentioned that "the day consumption of gas is gradually increasing; and it is expected that the reduced price will further encourage this, as well as induce a greater demand for general lighting purposes."

TOTTENHAM AND EDMONTON GAS COMPANY.

The Ordinary General Meeting of this Company was held last Saturday week, at the Offices, Willoughby Lane, Tottenham—Mr. GEORGE GRIPPER in the chair.

The SECRETARY (Mr. James Randall) read the notice convening the meeting; and the Directors' report and the accounts, which were summarized in the JOURNAL for the 27th ult., were then submitted.

The CHAIRMAN remarked that the Directors regarded the report as an eminently satisfactory one; and, considering all the difficulties that they had had to encounter during the last six months, he thought the outcome exceedingly gratifying. They had sold 16,755,300 cubic feet more gas than in the corresponding half of 1894, which represented an increase of 10·57 per cent. on the output. The number of consumers by ordinary meters continued to advance, and by automatic meters the increase was immense—in fact, they could not obtain these meters quickly enough. They had now 1825 prepayment meters in use by a class of consumers who would otherwise burn oil. The Company were in a good position with regard to coal, having made contracts to last two years on very favourable terms. The Directors now felt themselves in a position to safely announce their intention of reducing the price of gas by 1d. per 1000 cubic feet; bringing the charge down to 3s. The policy of the Company was to supply the public with gas at as low a price as possible; and they had accomplished much in this direction. When other companies round them raised their charges, they managed to keep to their price; and as coal had gone down, they had been able to reduce the price from 3s. 4d. to 3s. per 1000 cubic feet, which was a very gratifying fact. Unfortunately, residuals had, during the half year, been almost disastrous in regard to the price. Sulphate of ammonia had dropped to so low a figure that it had affected them to a considerable extent. As the proprietors were aware, £20,000 of "C" stock had been sold; and this had enabled the Directors to pay for the new carburetting apparatus. The stock had realized a premium of £76 10s. 9d. per cent., after paying the expenses of the sale. He concluded by moving the adoption of the report and accounts.

Mr. CORBET WOODALL, in seconding the motion, said he did not think the present accounts called for very much special observation. They were thoroughly satisfactory; but there was nothing peculiarly striking in any of the items. Perhaps the most conspicuous feature was the falling off in the residuals. This was largely accounted for by the fact that they now made gas from the residuals as well as from coal. A considerable amount of coke had been used in the manufacture of carburetted water gas; and consequently they had a smaller quantity for sale. The introduction of this water-gas system had been eminently satisfactory. The results during the first complete half year had been such as to thoroughly satisfy the Directors and their Engineer (Mr. W. H. H. Broadberry); and they looked for still more advantage from it in time to come. One matter worthy of observation, which had been noticed by the Chairman, was that the Directors had determined upon a further reduction in the price of gas from Michaelmas next. He thought the consumers in the district would appreciate the fact that, while for the past half year, after paying the dividends and interest, there was a balance of only £183, the Directors had decided upon a reduction in the price which represented, in a half year, about £750. They were therefore giving evidence of their confidence in the future by making a reduction which the accounts before them did not appear to justify; but, with an increase of 10·57 per cent. in the consumption, the Directors might very well feel some courage in discounting the future. There was another matter which was worthy of notice—that was, that gas appeared to be obtaining an entrance into a new sphere (one might almost say a double sphere) at both ends of the social scale. By the introduction of the incandescent gas-burner—making it possible for those who had hitherto regarded gas as a hot and perhaps insanitary means of lighting—a beautiful effect was produced by the use of a comparatively small quantity of gas; and this made gas a very formidable rival to the petroleum lamps and candles which had been used in the better class houses up to the present time. At the other end of the scale, prepayment meters had brought gas within the reach of working men, to whom the quarterly account for gas had been absolutely prohibitive. Of course, the system involved a considerable amount of capital outlay, because the Company had not only to provide a meter, but had to fit up the houses. The success attending the prepayment system had been remarkable, and accounted for a large proportion of the extraordinary increase the Directors had to report this half year.

Mr. H. MOORE said it seemed to him the Company were making extraordinary advance in obtaining new consumers. That they had fixed in eighteen months about 1800 prepayment gas-meters showed that one of the two "ends" referred to by Mr. Woodall was now burning gas to a large extent. A few weeks ago, he was making a survey in St. Luke's district; and he found there that The Gaslight and Coke Company, in addition to the meter and fittings, were giving a cooking-stove, which they fixed on a piece of artificial stone. They did not even ask the landlord to sign a paper. He might say that he had had to sign twenty or thirty papers, because the Directors of this Company said the fittings were liable to be distrained upon; and they wanted evidence that the landlord would not take a mean advantage, and raise a little money upon them. This, in his opinion, was not sensible, because fittings were worth very little, and the Act relating to the law of distress was an absurd one. He was sure there was no occasion to bother him or any other landlord to sign these papers. He suggested that the Company should also fix a stove in connection with the prepayment system.

The CHAIRMAN stated that they included a boiling-ring.

Mr. BROADBERRY remarked that cooking-stoves were put in with prepayment meters under certain conditions.

Sir H. CARTWRIGHT moved the declaration of dividends at the rate of 11½ per cent. per annum on the "A" stock and 8½ per cent. on the "B" and "C" stocks. He observed that no doubt, if a different policy had been pursued, they might have made a small addition to the dividend. But they were anxious to maintain the works in proper order; and, as would be seen from the present accounts, they had spent £1917 from the income of the half year for repairs and maintenance of works and plant. Under another course of policy, a large part of this would have been added to the dividends.

Mr. J. WARREN seconded the motion, which was passed.

The CHAIRMAN proposed, and Mr. MAGNUS OHREN seconded, the re-election as a Director of Mr. H. Bailey. This was agreed to, as was also a resolution, moved by Sir H. CARTWRIGHT, and seconded by Mr. MOORE, that the Chairman be re-elected.

The retiring Auditor (Mr. A. H. Baynes) was re-appointed on the motion of Mr. MAGNUS OHREN, seconded by Mr. W. B. RANDALL.

The usual votes of thanks were passed, and were acknowledged by the CHAIRMAN, the SECRETARY, and the ENGINEER.

Mr. BROADBERRY, in the course of his remarks, said he should like to make some reference to the statement by Mr. Moore that landlords would not be so petty as to distrain upon gas-stoves. This step had been taken in the case of one of the Company's stoves, and they had served a notice to the effect that an illegal distraint had been made. Then with regard to the pipes the Company put into houses, if they were fixed without the authority of the landlord, they could not remove them without his consent. They therefore thought it was better to obtain the consent of the landlord before fixing the pipes than have to get it afterwards. Then with respect to cooking-stoves, they always placed them on fire-tiles to protect wooden floors. The Company had supplied cookers with automatic meters for some time, under this arrangement: They spent a sum of rather more than £5 upon each house; and this included the meter, service-pipe, and fittings. But some people who required prepayment meters already had fittings in their houses; and it was thought that, as they did not require fittings, they ought to have some equivalent, and so they were allowed the use of a cooker. The Company had not gone so far as to supply both a cooker and fittings; but with the latter, they gave a boiling-ring. It was questionable whether it would be possible to include a cooker. He thought they were spending as much money on each house as they were justified in doing for the quantity of gas they were giving for a penny. He believed The Gaslight and Coke Company were supplying, in conjunction with the prepayment system, a cooker of the net value of £2 12s.; but he had not yet felt justified in recommending his Directors to go to that extent.

This concluded the proceedings.

HARROW AND STANMORE GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday last week, at the Albion Tavern, Aldersgate Street, E.C.—Mr. JAMES GLAISHER, F.R.S., in the chair.

The SECRETARY and ENGINEER (Mr. James L. Chapman, Assoc. M.Inst.C.E.) read the notice calling the meeting; and the Directors' report and accounts, to which allusion was made in the JOURNAL for the 27th ult., were presented.

The CHAIRMAN said the first paragraph in the Directors' report stated that "in pursuance of the powers of the Harrow and Stanmore Gas Act of 1894, since the 25th of March last, the Harrow District Gas Company and the Great Stanmore Gas Company have become one undertaking, under the title of the Harrow and Stanmore Gas Company." From this paragraph, it would be seen that up to March 25, they were separate Companies. The gas supply to Stanmore had been under an arrangement with the Lessee of that Company; but now they formed one undertaking. This rendered it rather difficult for him to make an analysis of the accounts; for they were in a state of transition. Therefore he could not give in the ordinary way a comparison of the expenditure. Turning to the receipts, comparing the Lady-day quarter with the corresponding period of 1894, the private gas-rental was £179 greater; but the public rental and under contracts was £452 more. But included under the latter heading was the money paid by the Lessee of the Stanmore Company in accordance with the arrangement to which he (the Chairman) had referred. The private rental in the Midsummer quarter was £297 in excess of the corresponding period of last year; and the public rental was £89 more. Coming to the residuals, they did very well by coke; but, in common with other gas companies, their failing point was sulphate of ammonia. The total receipts for the half year were £6209, as against £5056, which was an increase of £1153. This included the income from Stanmore, and the additional consumption of gas through the cold weather. On the other side of the revenue account, coal cost an additional £615; but this was for the most part due to the fact that they were paying for coal for Stanmore, as well as for Harrow. With regard to the other items, they included expenses which they had not had before, and which they would not have again. Expenses were incurred in applying for the luxury of an Act of Parliament; and they touched a small company very severely. The result was that the profit on the half-year's business was £1885, which was only £72 more than that of the corresponding half of last year. Feeling that this did not show the progress that was usually reported, and wanting to see what progress they had really made in Harrow lately, he had taken out the figures relating to the gas supplied in Lady-day quarter in the preceding five years. He found that in 1889, when gas was 4s. 9d., they supplied for private lighting at Harrow, within the inner circle, 7,250,000 cubic feet of gas; while in the same year in the outer circle, with gas at 5s., they supplied 1,039 000 cubic feet. In 1894, when gas was 4s. 6d. in the inner circle, the consumption was 8,739,000 cubic feet—being an increase of 1,489,000 in the five years; and in the outer circle, the increase was 455,000 cubic feet. Then in the Midsummer quarter, in the inner circle, they supplied in 1889, 3,525,000 cubic feet; and in 1894, 4,316,000 feet—being an increase of 791,000 feet. In the outer circle, in the Midsummer quarter, they supplied in 1889 573,000 cubic feet, and in 1894, 785,000 feet—being an increase of 212,000 feet. Adding the figures together, he found that in five years they had secured an increase of 2,947,000 cubic feet; but this did not include the public lighting which, compared in the same way, showed an increase of 330,000 cubic feet. He might remark upon this that both the inner and outer divisions had shown an almost proportionate increase; and that, although he had been complaining of the slow increase, there had been in the five years a total increase of 3,277,000 cubic feet. The gas made in the June half of 1889 was 12 million cubic feet; showing that the output was, at the time of the amalgamation, doubling in 20 years, which was satisfactory. Comparing the past half year with the June half of 1894, he found there had been an increase of 2,076,000 cubic feet, which was largely due to the great severity of the weather during January and February. It was gratifying to know that they had very few breakages of pipes during that period, and not a great loss of gas. The gas made in the half year was 26,119,000 cubic feet. Of this 6,369,000 feet had been disposed of under public lights and contracts. In the June half of 1894, the consumption under this head was only 1,826,000 cubic feet; but in the 6,369,000 feet was included the gas which had been supplied to Stanmore under contract—4,055,000 feet out of the 6,369,000 feet being due to Stanmore. The consumption for private lighting was 18,484,000 cubic feet, of which he calculated that 17,022,000 feet were consumed in Harrow and 1,462,000 feet in Stanmore. These figures worked out to this, that Harrow consumed in the six months for public and private purposes 19,336,000 cubic feet, and Stanmore 5,517,000 feet, which meant that, at the time of the amalgamation, Harrow was using about three-and-a-half times as much as Stanmore. They consumed on the works 240,000 cubic feet, which gave them a total of 25,093,000 feet accounted for out of the 26,119,000 feet manufactured, which left 1,026,000 feet unaccounted for. This was less than 4 per cent. on the make; so that they received money for 96 per cent., less that used on the works. It had always been "against the grain" with him to make gas and then lose it; and he could give great credit to their Engineer for having looked so well after the leakage. The coal carbonized amounted to 2559 tons, from which they produced an average of 10,207 cubic feet of gas per ton; and they obtained payment for 9800 feet, which was exceedingly satisfactory. There was one other matter to refer to. After the Board had looked over the expenses connected with their new Act, seeing they were already heavily capitalized before, they resolved to put £1500 to suspense account, in the hope that the future business would be such that they would be able to pay off out of the revenue this £1500. He thought it would be far better to do this than to put it down to capital. In conclusion, he moved the adoption of the report and accounts.

Mr. C. HORSLEY seconded the motion, which was unanimously carried.

The CHAIRMAN proposed the declaration of dividends at the rate of 7½ per cent. per annum on the original "A" capital, of 7 per cent. on the additional "B" capital, and 5½ per cent. on the additional "C" capital, and for the three months ending June 30 at the rate of 6 per cent. on the guaranteed shares—the dividend for the first three months having already been paid by the Great Stanmore Company.

Mr. HORSLEY seconded the proposition, which was carried.

The CHAIRMAN moved a vote of thanks to the Secretary and Engineer, remarking upon the unusually arduous nature of the duties he had had to undertake during the half year. In addition to the difficulties caused by the severe weather, he had had six miles of pipe to lay from Stanmore to Harrow; and this he had successfully accomplished, without any appreciable loss of gas. They had now 22 incandescent lights fixed in the streets; but they had as yet very few applications for prepayment meters.

Mr. MAGNUS OHREN seconded the motion, which was agreed to.

On the motion of Mr. A. F. PHILLIPS, seconded by Mr. OHREN, the services of the Directors were also suitably acknowledged.

OTTOMAN GAS COMPANY, LIMITED.

The Half-Yearly Meeting of this Company was held last Tuesday at the London Offices, 9, Queen Street Place, E.C.—Mr. A. J. DOVE in the chair.

The SECRETARY (Mr. T. Guyatt) read the notice convening the meeting; and the report and accounts, the main features of which were given in the JOURNAL for the 27th ult., were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, remarked that they were very much on all-fours with those for the corresponding period of last year. Some of the items were very favourable—for instance, although they had used an additional 158 tons of coal, it had cost them less by £72. The gas-rental had increased by £309.

Mr. CHARLES GANDON seconded the motion, which was unanimously carried.

The CHAIRMAN proposed a resolution adding £1000 to the reserve fund (making it £8000), and declaring a dividend at the rate of 7 per cent. per annum on both classes of shares.

Mr. GANDON seconded the proposition, which was agreed to.

The CHAIRMAN moved a vote of thanks to the Consulting Engineer (Mr. H. W. Andrews), the Engineer and Manager (Mr. John Gandon), the Secretary, and the staff at Smyrna.

Colonel J. LE GEYT DANIELL, in seconding the motion, mentioned that on this occasion they had with them their Engineer and Manager; and he must say, although in his presence, that he was much impressed by the result of the work that passed through Mr. Gandon's hands.

Each gentleman acknowledged the vote—Mr. GANDON remarking that all the staff in Smyrna did their best; and he thought the accounts showed that their endeavours bore good results.

On the motion of Mr. MAGNUS OHREN, seconded by Mr. R. L. ANDREWS, the Chairman and Directors were also thanked for their services.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The Directors of the British Gaslight Company recommend a dividend at the rate of 10 per cent. per annum, for the half year ending June 30 last, with a bonus of 2s. 6d. per share.

The East Ardsley Gas Company had a falling off of 500,000 cubic feet in their consumption during the six months ending June 30—from 7,000,000 to 6,500,000 cubic feet. This was due to the Great Northern Railway Company not consuming so much gas, and to the effects of the severe frost of last winter, which greatly affected the mains. The amount received for gas was £824, which was £74 less than in the June half of 1894. The profit was £318, which made the disposable balance £446, from which a dividend at the rate of 5 per cent. per annum has been declared.

The half-yearly meeting of the Lewes Gas Company was held on Wednesday last, under the chairmanship of Mr. James Broad. The accounts which were presented showed a profit for the six months of £1550. After providing for interest on mortgages, &c., the balance of net revenue was £1779. The Directors recommended that a dividend for the half year be declared at the rate of 5 per cent., which would amount to £1299. The Directors announced with much regret the death of their colleague, Mr. George Lenny; and stated that they had appointed Alderman E. Hillman to fill the position. The Chairman, in moving the adoption of the report, said, as a consequence of the vacancy caused by the death of Mr. Lenny, they thought it was only due to their worthy Secretary, who had occupied that post for 35 years, to offer him a seat on the Board; and in doing so they considered that he would make a most valuable Director. Alderman Hillman had accepted the offer. This appointment caused a vacancy in the post of Secretary, Collector, and Solicitor; and the Directors considered they could not do better than elect Mr. H. J. Hillman, who they hoped would prove as valuable a servant as his father had been. The balance-sheet and report were highly satisfactory. The production of gas was very gratifying, as notwithstanding an increase of less than 7 tons of coal, they had produced nearly 2 million cubic feet more gas in the six months than in the corresponding period of 1894. They had had an additional 259½ chaldrons of coke for sale, and disposed of 2480 gallons more tar, and an extra 51 cwt. of sulphate of ammonia. The increased amount of gas which had been sold amounted to a little more than 5½ per cent., which was exceedingly good, as when they incurred a very heavy expenditure on gasholders, Mr. Paddon told them they would want to increase their make of gas 5 per cent., adding that, if they did so, they would go on well. He was glad to say it had increased by 5½ per cent.; while they had paid only about £10 more for coals. In return, they had received an increase of £242 for

gas, £64 for coke, and £55 for tar. There had been a decrease of £45 in the amount received for sulphate of ammonia; but this was more than made up by the larger stock, which represented £51. The motion was passed; and, among the other business transacted, the Directors were authorized to raise a sum of £5000 of the additional 7 per cent. capital for general purposes. Before the meeting terminated, the shareholders heartily thanked their Manager (Mr. Levi Monk); the Chairman remarking that the Directors were delighted with the way in which he discharged his duties.

The Chairman of the Richmond Gas Company (Mr. T. J. Carless) was able to congratulate the shareholders, at their recent meeting, upon the result of the half-year's work, which had been very successful. There was a considerable increase in the consumption of gas, in spite of the competition of the electric light. He was glad to say favourable contracts had been entered into for the supply of coal; and the Directors were enabled to reduce the price of gas 2d. per 1000 cubic feet, which made the charge 2s. 10d., comparing favourably with their neighbours, whose price was 2s. 11d. The Richmond Company had to supply gas of an illuminating power of 15 candles; while their neighbours had only to furnish gas of 14-candle power. They had now several hundred penny-in-the-slot meters in use; and more of them were on the point of being fixed. Turning to financial matters, he said that, on the expenditure side of the revenue account, there was an increase in the consumption of coal, amounting to 900 tons, at a cost of £478. There was a decrease of £570 in the repairs and maintenance account, due to the fact that some heavy charges fell under this head in the corresponding half of 1894. There was also a considerable decrease in the cost of distribution of gas, owing to the extensive renewals of mains undertaken the former half year. On the other side of the account, was shown an increase of 10 per cent. in the consumption of gas, which he believed was the largest the Company had ever known. This was due to the cold weather in the early part of the year; and the receipts were thus increased by £1000. The stove-rents were increasing by leaps and bounds; and from this source alone, they received nearly £400. The price of the residual products had been low; and the amount remained about the same. The profit and loss account showed a balance of net profit £9106, of which, when the half-year's dividends (£3980) had been paid, a balance of £5126 would be carried to the next account; and this very satisfactory statement justified them in reducing the price of gas. The report was adopted; and dividends were declared of 5 per cent. on the "A" and "B" stocks, and 3½ per cent. on the "C" stock. The shareholders testified to their appreciation of the work of the Directors by increasing their fees to £250. The usual votes of thanks were passed to the Chairman and his colleagues, and to the Engineer and Secretary (Mr. T. May).

The half-yearly meeting of the Rugby Gas Company was held on the 30th ult. The Directors' report showed the receipts for the half year ended June 30 to have been £6595; and the expenditure, £3934—leaving a balance of £2661 to be carried to the profit and loss account. A dividend at the rate of 11½ per cent. per annum, free of income-tax, was declared. This will absorb £1719.

The annual report and accounts of the Sunderland Gas Company (which were noticed last week) were presented to the shareholders at their meeting on Thursday. The Chairman (Mr. James Stokoe), in moving the adoption of the report, referred to the new retort-house that was being erected, and said it could produce 2 million cubic feet of gas in 24 hours; this being an increase of 66 per cent. The new gas-holder would contain 1½ million cubic feet, giving an increased storage capacity of 75 per cent. He added that since the last holder was erected in 1885, the make of gas had increased 285 millions, or a rise of 61 per cent. during the ten years. The revenue from gas and residuals had risen from £54,000 to £84,000—an advance of £30,000, or a percentage of 55. Some 42 years ago, there were two Gas Companies in the town. It would, however, be unfair to give contrasts with figures relating to that period; but he would deal with the time when they became amalgamated. The revenue in 1855 was £16,000; whereas in 1895 it was £84,000—a difference, therefore, of £68,000, or 425 per cent. The report was adopted; and dividends were declared of 5 per cent. on the original stock and 4½ per cent. on the additional stock for the half year ending June 30.

Water Companies.

The Brymbo Water Company report that the total number of houses now supplied by them is 3206—an addition of 67 having been made during the past year. The balance on the net revenue account is £1435, deducting from which the interim dividend and the interest on debentures leaves only £292. In order to pay a dividend at the rate of 4 per cent. for the second half of the year (making 4½ per cent. for the year), the Directors have withdrawn £150 from the reserve fund, and have carried over to next year's accounts £253 of the exceptional expense caused by the frost. The cost incurred by the Company in obtaining their new Act was £665—a sum considerably higher than it would have been but for opposition by Sir W. Grenville-Williams.

The annual accounts of the Drogheda Water Company show a net balance of £804 available for dividend, out of which a dividend of 3½ per cent. has been declared. There was an increase in the water-rental of close upon £100.

The report submitted at the ordinary meeting of the South Essex Water Company last Saturday week showed a profit of £5637 for the half year. Dividends of 5 per cent. on the preference stock, £4 15s. on the ordinary 1891 stock, and £3 6s. 6d. on the 1882 stock were recommended. The Chairman (Mr. Cracroft Fooks), in moving the adoption of the report, said 207 new services had been added during the half year, yielding an increase in the revenue of £326 per annum. A 12-inch main, connecting the low-service main with Ilford, had been laid, and was now in use. Additional pumping machinery had been erected at Romford; and the Directors were making arrangements to construct the second section of the Hog Hill reservoir during 1896. Mr. J. C. Amos seconded the motion, which was agreed to.

A New Reservoir for Redcar.—The Redcar District Council last week accepted a tender, submitted by Mr. Atkinson, of Stockton, for the construction of a new reservoir for the sum of £1405.

THE LIVERPOOL CORPORATION AND THEIR ELECTRIC LIGHTING PURCHASE.

A "Consequential" Provisional Order to be Applied for.

A Special Meeting of the Liverpool City Council was held last Wednesday—the Lord Mayor presiding—for the purpose of considering a resolution asking "the authority and approval of the Council for the intention to make application to the Board of Trade for the purposes of the Electric Lighting Acts, 1882 and 1888, for a Provisional Order to supply electricity for public and private purposes, under the provisions of the said Acts, within the area of the City of Liverpool, as the same may exist at the time of granting the said Order."

Alderman Smith, the Chairman of the Special Lighting Committee, in moving the resolution, said he thought it very undesirable that the Corporation should allow any portion of the extended city area to be dealt with by another company who might desire to come in and supply electric light to the new districts. This resolution was merely intended to give the Corporation power to apply for a Provisional Order, which would enable them to supply electricity throughout the whole of the city, and not allow any other company to interfere with them.

Mr. Brownbill seconded the motion.

Sir Arthur B. Forwood said that at a recent meeting of the Council it was stated that a special meeting would be required to give effect to the proposed purchase of the Electric Company's undertaking.

The Town Clerk said the Provisional Order referred to in the resolution just moved in no way related to the purchase of the Electric Light Supply Company's undertaking. That would have to be dealt with in a separate Bill.

Sir A. B. Forwood: Then the proposal is to advertise that we are going for a Provisional Order which will enable the Corporation to become purveyors of electric lighting independently, and that we do not commit ourselves to the purchase of the Electric Supply Company's undertaking? If that is so, I have nothing whatever to add.

The Town Clerk: The purchase of the Electric Supply Company's undertaking has been already arranged, and has received the sanction of the Council. The Bill to confirm the purchase was before Parliament; but it had not time to pass.

Sir A. B. Forwood said he understood that Parliament required that a majority of two-thirds of the members present should vote for the motion to apply for a Provisional Order.

The Town Clerk said the procedure in this instance did not require any stated majority of the Council to vote for an application for a Provisional Order.

Alderman Smith: As I understand it, what Sir Arthur Forwood wants is to discuss the purchase of the Electric Supply Company's undertaking.

Sir A. B. Forwood: Quite so.

Alderman Smith: Then I do not think there is any disposition on the part of any member of the Council to impede a discussion of the matter. I have not seen the Bill brought in by the Company; and I think we might have copies of it before us.

Sir A. B. Forwood: I can see that this matter is surrounded with great difficulties. The Council will find itself committed to the purchase without an opportunity of discussing the same. We are escaping the precautions which Parliament gives to the general public; and we, by a bare majority, consent to this Company promoting a Bill. If that is so, then we are being done.

Alderman Smith objected to the assertion that the Council was "being done." There was no earthly reason why the Council should not discuss the matter; and the more it was discussed, the better would it be for the city.

Sir A. B. Forwood said he was afraid the Council had drifted into a position by which they were precluded from discussing the matter before purchasing the works. If the limit of the present proposal was to advertise that a Provisional Order be applied for, he would say no more; but he would endeavour to find an opportunity of bringing the question forward at some future time.

Mr. Petrie, as a member of the Lighting Committee, said he wished to inform Sir Arthur Forwood that the Council had passed a resolution authorizing the purchase of the Electric Supply Company's undertaking. The Committee made the best bargain they could with the Company. It transpired at the last moment that Lord Morley objected to the Company handing over their works without a special Bill being promoted; and such a Bill was promoted by the Company. The Provisional Order now in question was for the purpose of enabling the Council to extend their lighting powers to the districts about to be included in Greater Liverpool. They had heard that very recently application had been made to the local authorities of West Derby and the other districts by a Syndicate in the South of London, who wanted to acquire these areas for the purpose of supplying electric light. The Committee thought that the Syndicate ought not to be allowed to come in and establish new works. He (Mr. Petrie) felt convinced that if Sir A. B. Forwood understood the position of affairs, he would not oppose this motion.

Sir A. B. Forwood read the portion of the report concerning the procedure to be adopted, and said that it would have been better if the Council had been fully informed that, by taking the course they had taken, they were losing the safeguards as to the statutory majorities laid down by Parliament.

The Town Clerk said it was impossible for the Corporation to have introduced a Bill to carry out the agreement with the Company. As a matter of procedure, they found it necessary for the Company to promote a Bill; and whether a Bill was promoted or a Provisional Order was obtained, the Council were in exactly the same position—no majority being required in either case.

Mr. Taylor said that the Committee had practically unlimited powers; and there could be no suspicion of the Committee having resorted to any tactics in order to evade examination. If the transaction with the Company was not through by the 31st of December, it was open to either party to be "off;" and the Council should understand that they were applying to the Board of Trade for a Provisional

Order which was consequential upon the purchase by the Corporation of the Electric Supply Company.

Sir A. B. FORWOOD: In which way consequential?

Mr. TAYLOR: I say morally consequential. Proceeding, he said the Corporation had made a bargain with the Company for the purchase of their undertaking, by virtue of which the Corporation could supply electric light over the city, including the area now supplied by the Company. But it would be a breach of faith if application was made to the Board of Trade after the bargain had not been carried out.

Alderman SMITH opposed this view. Whether the bargain was carried out or not, he hoped the Council would make an application, at any rate, for the area outside the area of the Company. His personal view was that they ought to have gone into competition with the Electric Company.

The motion was then passed; and the ordinary business of the Council was proceeded with.

ELECTRIC LIGHTING NOTES.

The Exeter City and County Council recently considered, at a meeting specially convened for the purpose, the advisability of negotiating with the Exeter Electric Light Company for the acquisition of their undertaking. The Mayor (Alderman Perkins) presided. The Town Clerk (Mr. G. R. Shorts) said he had received a letter from the Solicitors to the Electric Light Company, who stated that they understood a meeting of the Council was to be called to consider this question. It was no doubt known that the Company had had an offer of £7000 for their undertaking from a large London firm, and there was a Syndicate of local gentlemen who would be prepared to give upwards of £8000 for it. The critical condition of the Company rendered it necessary that an immediate decision should be come to; and if the Council were willing to purchase for £10,000, the Directors would recommend the proprietors to accept this amount. A memorial, signed by all the principal tradesmen in High Street, Fore Street, and Queen Street, had also been received in favour of the acquisition of the works by the Council. The Deputy-Mayor (Dr. E. J. Domville), who had called the meeting in response to a requisition he had received, remarked that the step he had taken did not pledge the authority to take any action in the matter; it simply gave them an opportunity of considering the question, and hearing what their legal position was. Under the Provisional Order, if the Company became insolvent, the Board of Trade could transfer the powers granted; and certain conditions were laid down under which the undertaking could be purchased. The matters involved required careful consideration. The less one said about the management of the Company, the better. It was evident that misfortune had dogged its footsteps from the beginning; and the expenditure of a capital of £23,000 had not resulted in any profit to the shareholders. A large portion of this capital was now worthless to a purchaser; and what they had to think of was the present value of the undertaking, the possibility of the Company carrying out their obligations, and the further demands that would be likely to be made on any purchaser in extending the works. They had also to consider whether it would be wise for them to wait the 17, 18, or 19 years that must expire before they could acquire the works under the Provisional Order, or whether they should seize the opportunity which now offered itself of purchasing them. He thought it would be best to refer the whole subject to a Special Committee, and he moved that this should be done. Mr. Ward seconded the motion, which, after some discussion, was withdrawn. Mr. W. Wreford then moved a resolution declaring it to be expedient that the control and supply of the electric light in the city should be in the hands of the Council. By doing this they would, he said, only be reaffirming what they did three or four years ago, when they promoted a Provisional Order in opposition to one applied for by the Company. Mr. E. C. Penny seconded the motion. He said he had always held that such an important element of civilization as light should be in the hands of the municipality. He thought the city made a great mistake in not purchasing the gas-works when they had the opportunity some years ago; and if they let the present chance slip, they would be making another mistake. Mr. Force said three-fourths of the Council were in favour of the purchase of the gas-works on the occasion referred to; but their resolution was overruled by the ratepayers. Might not the same thing occur again now? He should like to see the feeling of the ratepayers expressed before they considered the matter thoroughly. The Town Clerk said in this case it would not be necessary to take a poll of the ratepayers. The motion was carried—29 voting for, and none against it. Mr. Wreford then proposed that it was desirable to enter into negotiations with the Electric Light Company, with a view to acquiring their undertaking. The Company had, he said, come to the conclusion to transfer their shares and debentures to a London firm for £7000; and they had no reason assigned yet why the Council should go further and offer £10,000. But this was a matter of detail which could be threshed out in Committee. Was this a favourable opportunity for purchasing? Under the Provisional Order, they could at the end of 26 years take over the works by paying the value of the plant and an equivalent to the previous five years' profits; and only at the end of 42 years could they acquire the property without paying anything for profits. They had now a chance of getting the undertaking on much better terms; and he believed they could effect the purchase without inflicting any pecuniary burden on the ratepayers. The motion was carried; and the further consideration of the matter was referred to the Council in Committee, with power to appoint a Special Committee to decide points of detail.

A Local Government Board Inquiry was recently held at Oldham, by Mr. W. J. B. Clerke, M.Inst.C.E., one of their Inspectors, in regard to an application by the Oldham Corporation for power to borrow £15,000 for electric lighting purposes. The Town Clerk (Mr. A. Nicholson) explained that in 1890 the Corporation obtained a Provisional Order authorizing them to supply electricity within the municipal borough. In due course, a scheme was prepared by Professor Kennedy, and application was made for power to borrow £40,000 to enable the Corporation to carry it out. The scheme was approved of—borrowing powers to the extent of £27,000 being sanctioned. Plant was provided sufficient to supply simultaneous lighting for about 2500 glow lamps of 8-candle power each, which is equivalent to 5000 incandescent lamps of similar power. The works were completed, and commenced to supply electricity on March 15, 1894. There were then only seven consumers, who took energy to supply 979 lamps of 8-candle power. The increase in the consumption of electricity developed so quickly, that in January, 1895, the whole capacity of the plant provided had been brought into use. The Corporation therefore consulted Professor Kennedy on the matter; and he advised them as to the proposed extensions. Hence the application for further borrowing powers. The position of the Corporation on March 25, 1895, the end of the first year's working, was as follows: They had then expended on the erection, fitting up, and completion of the station, mains, and services, meters, &c., in round figures, £25,000. The gross revenue for the year amounted to £1916; and the gross expenditure, to £1272—leaving a balance of £644. The interest on loans and the payments to the sinking fund came to £796—leaving a deficiency of only £152. This result was attained notwithstanding that the Corporation had charged at the rate of 6d. per unit only, whereas in most towns the charge had been 7d. or 8d. On the 25th of March last, the number of consumers was 55; and the number of units sold 68,998. On the same date, 99 arc and 1946 incandescent lamps were being supplied—together equivalent to 6940 incandescent lights of 8-candle power. During the five months intervening between the 25th of March and the 24th of August, the expenditure on capital account had increased to (in round figures) £26,400; thus practically exhausting the £27,000 borrowing powers. The number of consumers rose from 55 to 85—an increase of 30, or 64·7 per cent., in the last five months. The number of lights equivalent to 8-candle power went up from 6940 to 9334—an increase of 2394, or 34·5 per cent. Now there were places being wired and fitted up for lighting, and would shortly be complete, which would require 1200 more lights of 8-candle power. The Engineer had told him that the station had its full load on; and if the general consumption went on as it had done from day to day, these 1200 lamps could not be supplied until further plant was obtained. The proposed extensions would, according to the Engineer's estimate, cost (in round figures) £11,000. The contemplated expenditure would increase the power to supply electric energy 136·3 per cent., at a cost equivalent to 48·1 per cent. on the outlay up to date. This reduced cost was accounted for by the fact that the conduits laid in the streets were made specially to allow of their being used for the three-wire system when necessary, without having to expend additional moneys on street works, and the electric station having been constructed with the view of placing additional plant therein. Mr. H. Burstall, the Chief Engineer to Professor Kennedy, was then called, and answered a few inquiries relative to details of the scheme. He stated that on March 25 last there were 4576 yards of electric mains. The Inspector asked how they found the electric light affected the gas-works. The Town Clerk replied that at the present time it had practically made no difference. The increase in the consumption of gas during the past year had been at an equal ratio to previous years. The Inspector asked if there was any depreciation in the value of the gas undertaking. The Town Clerk said not at all. No opposition was offered to the application; and at the close of the inquiry the Inspector visited the station.

The Salford Town Council having applied to the Local Government Board for sanction to borrow £18,000 for electric lighting purposes, an inquiry into the matter was held on the 30th ult., at the Town Hall, by Mr. W. J. B. Clerke, M.Inst.C.E. There was no opposition to the application. The Town Clerk (Mr. S. Brown) explained that there had already been an inquiry into an application to borrow £50,000 for electric lighting purposes; but on that occasion sanction was granted for the raising of £32,000 only, in respect of which estimates were submitted. The £18,000 now applied for was the balance of the £50,000. It was proposed to spend something approaching half of the sum asked for in accordance with estimates submitted; and the Council hoped it would not be necessary for another inquiry to be held with regard to the balance. The Inspector remarked that, though he could not pledge the Local Government Board to anything, he saw no reason why another inquiry should be held for the remainder. Of course, at present, sanction could not be expected for a greater amount than that for which definite proposals were submitted. Mr. E. Manville, the Electric Lighting Engineer of the Corporation, said the works already carried out were in accordance with the plans originally submitted. In regard to the present application, they could simply show an estimate of expenditure amounting to £7770. With the exception of £1500 to be laid out on premises, this sum was entirely for extension of mains and to provide the necessary apparatus for the utilization of the current passing through the mains. The extensions were outside the compulsory area. This was all the evidence submitted.

The Cheltenham Town Council had before them yesterday week proposals, submitted by the Lighting Committee, for lighting the principal parts of the town by electricity, for which some 50 arc lamps would be required to replace 59 one-light, 4 three-light, and 60 four-light gas-lamps. An alternating current system, with a separate and independent transformer for each lamp, was recommended, the capital cost of which was estimated at £3100; and with 30 all-night arcs and 30 switched off at midnight the total annual cost would be £957, against £550 for gas. The adoption of the recommendation having been moved by Alderman Norman, Mr. Margrett proposed an amendment, with a view to extending the lighting beyond that recommended by the Committee; and this was carried with the original motion.

The main topic of debate at the meeting of the Blackpool Town Council last Tuesday was the proposal to spend £30,000 in extending the electricity works. It was stated on behalf of the Committee in charge of the department, that the present capacity of the works is 590 kilowatts, and so great had been the demand for current that the plant was now working at 580 kilowatts, which meant that there was no reserve plant to fall back upon in case of breakdown. Statistics were produced to show that the department was being worked at a profit, and that the applications for current were already so numerous that additional plant, equal to 600 kilowatts, should be provided. Exception was taken both to the extension of the works and the appointment of

Mr. Robert Hammond as Consulting Electrical Engineer. It was contended that the works were not being conducted on a business-like method; and it was especially urged that a Consulting Engineer was not necessary, and that the extensions could be supervised by the Resident Engineer. Ultimately it was decided that no extension of the department should be permitted for twelve months, and that the services of Mr. Robert Hammond should be dispensed with.

It would seem that the St. Pancras Vestry are already repenting their ill-advised boycott of the London Hydraulic Power Company; for on Wednesday last Mr. M'Gregor gave notice that, at the next meeting, he would reopen the question. The reason appears to be that the landlords of the premises affected have asked the Vestry to sanction the laying of a service-pipe—not a main—only seven yards over the parish-boundary; and the Chairman of the Vestry announced that, at the next meeting, he would be prepared to rule how long a period must elapse, according to the new bye-laws, before a rescinding vote may be taken. Mr. M'Gregor said the leading members of the Electricity Committee had now changed their minds on this question; but Dr. Bell challenged the statement, which he thought ought not to be made public. While noticing this matter, it may be mentioned that, contrary to the terms of his appointment, the new Chief Electrical Engineer of the Vestry has taken up his residence—inadvertently, it is said—a short distance outside the parish; and the Chairman of the Vestry has ruled that this officer will not be entitled to any salary until he moves within the parish boundary. Some of the outspoken criticisms of the members must have sounded rather harsh to this recently-appointed gentleman; but it is to be hoped that his remuneration of £600 a year will tend to salve his feelings.

WIGAN CORPORATION WATER SUPPLY.

An Augmentation of Supply Needed—Proposed New Reservoir.

Ample evidence was supplied by Mr. Alderman Richards, at the monthly meeting of the Wigan County Borough Council last Wednesday, that, for safety, it is necessary that immediate steps be taken to provide for an additional supply of water. Recognizing this, the Water Committee, on the 29th ult., passed resolutions instructing the Borough Engineer to make a survey of land at Worthington, to prepare plans and estimates of the cost of constructing a new reservoir there, and to report as to the probable amount of water that could be impounded. They also directed that information be obtained from the Liverpool and Manchester Corporations respectively as to the price at which a daily supply of 500,000 gallons of water could be obtained. The confirmation of these resolutions was moved by Alderman Richards, who pointed out that the Council could safely adopt them, because they did not bind them to anything. All they had to do was to look round and see what was the best mode of obtaining an extra supply of water. The town continued increasing while the means of supply remained the same; and he was sorry to say that at the present time the reservoir was some 20 feet below the overflow mark. This must be more or less alarming to those who had the care and management of the water supply. He found on referring to the reports of Mr. Hunter, the late Surveyor to the Corporation, that, as far back as 20 years ago, the supply was regarded as needing augmentation, and if that was so then, what must be the need now, when the population was 20,000 more than it was in 1871? The reason the supply had continued sufficient was due to several causes, the first of which was that ten years ago the railway companies, who had been paying £1200 a year for water, ceased to take a supply from the town. This, of course, was a large loss of revenue; but it was a saving of 24 million gallons of water per annum, or equal to 24 days' supply. Then the fixing of water-meters had been the means of both increasing the revenue and preventing waste; while a more strict system of supervising fixtures had resulted in an additional saving. Further, the acquisition of the Whitley reservoir had been of great use to the town—in fact, he might say, during several summers, it had been their salvation. These various precautions had been the means of postponing the necessity for an additional supply up to the present time. But how much longer they would be able to go on, he could not possibly say; and it was the duty of the Water Committee to bestir themselves if they did not wish to be blamed in case of scarcity of water. Since 1875, the customers had increased by 5417; while the number of houses in the town had risen by no less than 2843. During the same period, the population had gone up by 19,000; and the total quantity of water consumed had advanced from 287 million gallons, or a daily consumption of 786,000 gallons, to 346 million gallons, or a daily consumption of 950,000 gallons. The storage capacity, with the exception of the little reservoir at Whitley, was, as already remarked, the same now as then; and he thought he had said sufficient to justify the action of the Committee, as set forth in the resolutions which appeared in the minutes. In answer to a question, Alderman Richards said the plan most favoured by the Committee at present was the erection of a new reservoir on the present gathering-ground, so as to impound an increased quantity of water. It was not intended to obtain water from either the Liverpool or Manchester Corporation unless it was absolutely necessary, because buying water in this way was very expensive indeed. Mr. Johnson mentioned that he had already made inquiries on the subject; and he was told emphatically that additional water could be impounded on the present gathering-ground. The minutes were confirmed.

The New Water Scheme for Shrewsbury.—The proposal to obtain a new supply of water by pumping from the Severn, at a cost of £48,000, is meeting with some opposition from the owners of property and the ratepayers of Shrewsbury, whose vote on the question has been solicited by the Water Committee of the Town Council. The Ratepayers' Water Committee have passed a resolution to the effect that the Corporation should deal with the drainage question before proceeding with the water scheme; and the Committee pledge themselves to use all legitimate means to compel them to do so. In a circular which has been issued, the supply is condemned on sanitary grounds.

THE RECENT SCARCITY OF WATER AT THE EAST-END.

A Local Government Board Inquiry to be Held—Action by the County Council—Investigation Welcomed by the Company.

With reference to the deputation which waited upon the President of the Local Government Board on the 30th ult., in order to urge upon him the necessity for an inquiry into the supply of water in the district of the East London Water Company, the Permanent Secretary of the Board (Sir Hugh Owen) has addressed a letter to Mr. G. Grocott, the Clerk to the Vestry of St. John, Hackney, stating that Mr. Chaplin "has given directions for the holding of an inquiry as to the circumstances which occasioned the deficiency of water supply in the Metropolitan area comprised in the district of the East London Water-Works Company, the effects of the deficient water supply as regards the public health, and the means which should be adopted with the view of preventing a recurrence of any such deficiency." The arrangements for the inquiry have not yet been settled; but Mr. Grocott has intimated to Sir Hugh Owen that he will be prepared to adduce the evidence on which the complainants rely, and has offered to place the Hackney Town Hall at the disposal of the Board for the inquiry.

The Water and Public Control Committee of the London County Council, after considering the representations made by the deputation of representatives from Vestries and District Boards who waited upon them on the 27th inst., have resolved to instruct the Solicitor to the Council to collect evidence with a view to taking proceedings against the East London Water Company under the Metropolis Water Act of 1871, and to submit a further case to Counsel with regard to certain points which have been raised.

At the ordinary meeting of the Directors of the East London Water Company last Thursday, the Secretary (Mr. I. A. Crookenden) reported that he had received a communication from the President of the Local Government Board, announcing his intention to hold a departmental inquiry into the state of the water supply in the East of London. The Chairman (Mr. George Banbury) remarked that this intimation of the determination of the Local Government Board to institute an inquiry into recent events connected with the water supply of the East-end was a source of extreme gratification to himself and his fellow-Directors; for they were prepared to face, with the utmost confidence, the fullest examination that could be devised into the Company's affairs, and the efficiency of the supply of water which they gave to their customers. Such an inquiry, if made thoroughly exhaustive, would, he felt sure, have a strong tendency in the direction of removing many erroneous impressions which now undoubtedly existed in the public mind. Several other Directors present took a similar view of the situation, and expressed their satisfaction at Mr. Chaplin's decision, as well as the readiness of the Company to meet all the charges formulated by the Vestries. It was incidentally stated by the Secretary, in the course of the discussion, that the Company were now pumping into their district no less than 47 million gallons of water per day, after allowing for "pump slip." This supply, he added, was equal to 36 gallons per head per day. At the close of the discussion, Mr. Crookenden was directed to instruct the officers of the Company to furnish all possible information that could be made available for the purposes of the forthcoming inquiry, and to help forward the proceedings to the best of their ability, with a view to eliciting the real truth of the whole matter.

THE LONDON COUNTY COUNCIL AND THE WATER QUESTION.

The Chief Engineer's Report on Available Sources of Water Supply.

(*Concluded from p.* 498.)

IX.—*Estimated Cost of Works.*

This is a subject which has engaged my most careful attention; and, assisted as I have been by Mr. R. Hassard, M.Inst.C.E., and Mr. G. F. Deacon, M.Inst.C.E., the Engineer of the Liverpool Water-Works (Vyrnwy supply), I believe I have arrived at figures which can be relied upon. They have been based upon prices actually paid for recent work of a similar nature; and when it is considered that, after making full allowance for actual construction, I have provided a sum exceeding £5,000,000 to cover unforeseen contingencies and parliamentary and professional charges, I believe that, if anything, the cost, on further working out, or in actual construction, would be reduced in amount.

As a total for the gross supply of 415 million gallons a day to provide for all contingencies for a period of fifty or sixty years hence, the summary of my estimate would be as follows:—

Head works at Llangorse, Yrfon, Edw, Ithon, and Wye, with their collecting and communicating conduits and compensation reservoirs	£8,135,000
Aqueduct from Llangorse to Elstree	7,160,000
Aqueduct from the Yrfon reservoir to Banstead	8,070,000
Terminal works at Elstree, filters, and connection with existing distribution-pipes	4,850,000
Terminal works at Banstead, filters, and connection with existing distribution-pipes	5,500,000
	£33,715,000
Contingencies, 10 per cent.	3,371,500
	£37,086,500
Professional and parliamentary expenses	1,685,750
Total	£38,772,250

Say £38,800,000 for 415 million gallons a day, or at the rate of £93,494 per million gallons.

But, as before pointed out, it is not necessary that the whole of this expenditure should be incurred in the immediate future. It will be sufficient if, in the first instance, the supply afforded by the Usk from the Llangorse reservoir, of 182 million gallons a day, be brought into

the Elstree reservoir. This would cost, as per estimate below, say £17,500,000, or at a rate of £96,000 per million gallons per day.

First instalment, Llangorse and Usk reservoirs, 182 million gallons a day	£3,175,000
Aqueduct from Llangorse to Elstree	7,160,000
Terminal works at Elstree, including filters and distribution	4,850,000
	£15,185,000
Contingencies, 10 per cent.	1,518,500
	£16,703,500
Professional and parliamentary expenses	759,250
Total	£17,462,750

£17,462,750 for 182 million gallons a day, or at the rate of £95,949 per million gallons.

Following this, an additional supply of 18 million gallons a day could be obtained from the Edw, at a further cost of £625,500, which would bring the total volume up to 200 million gallons a day, at a total cost of £18,095,250, or £90,476 per million gallons delivered.

Previous expenditure		£17,462,750
Edw supply, including reservoir and conduit to main aqueduct, 18 millions gallons a day	£550,000	
Contingencies, 10 per cent.	55,000	
	£605,000	
Professional and parliamentary expenses	27,500	
Total for the Edw supply		632,500
Total for a supply of 200 million gallons a day		£18,095,250

Or at the rate of £90,476 per million gallons.

It is obvious that the remaining supplies which can be derived from the Yrfon, the Towy, the Ithon, and the Upper Wye, can be brought in one by one at a future date; but they would involve the construction of the second line of aqueduct from the Yrfon to Banstead.

From the whole of the above figures, I am not only confident that this scheme of works is the best for the supply of London, but I believe it to be the cheapest that could be introduced. If we assume that the present supply of London, as afforded by the eight Companies, is at the rate of 192 million gallons a day, as in 1893, and that it cost £93,500 per million gallons, the Companies' works should be worth £17,952,000—a sum far below that which the Companies claim for the transfer of their united undertakings to the Council.

X.—*Other Sources which have been Proposed for London.*

I feel that I must not quit the consideration of this subject without glancing at some of the schemes previously proposed for the supply of the Metropolis, so that the Committee may understand my reasons for not taking them in preference to the one described.

Cumberland Lakes.—Mr. R. Hassard, M.Inst.C.E., the gentleman who has been associated with me in the preparation of this report, in conjunction with the late Mr. Hemans, M.Inst.C.E., laid before the Duke of Richmond's Commission in 1869 a scheme for obtaining water from the Cumberland lakes. The total supply proposed from that source was 287 million gallons a day. The length of the aqueduct was 270 miles, and it delivered the water near Edgware, at an altitude of 232½ feet above Ordnance datum. A portion of this scheme has since been appropriated for the supply of Manchester. The length of its conduit, and the circumstance that it delivered its water 80 feet below the proposed reservoir at Elstree renders it in every way a less desirable scheme than that which I have laid before you.

River Severn.—It may be remembered that the late Mr. Bateman, F.R.S., proposed a supply of water from the upper basins of the Severn. He calculated that 230 million gallons a day could be obtained; that the aqueduct would be 180 miles in length, terminating at Stanmore, at an altitude of 270 feet above the sea, or more than 42 feet lower than the suggested Elstree reservoir. The possibility of carrying out the project as designed by Mr. Bateman has been rendered impossible by the fact that Liverpool has appropriated the supply from the Vyrnwy, which circumstance, taken in connection with the long aqueduct and the low altitude of delivery, makes it clear to my mind that it is less advantageous than the scheme now laid before you.

Bala Lake Scheme.—During the time I have been engaged in writing this report, Mr. Price Williams, M.Inst.C.E., has laid before me a project originally designed for the purpose of supplying certain large towns in the midland districts from Bala Lake, with an ultimate extension to London. Seeing that the altitude of Bala Lake is only 530 feet above sea-level, and that its distance from London would involve a conduit about 200 miles in length, I do not consider that it could be economically constructed, even were the quantity of water available sufficient; and I am sure it could not be delivered at the same altitude as that proposed in the scheme which is the subject of this report.

Dartmoor.—Since writing my report of October, 1890, I have looked somewhat carefully into the possibility of obtaining a supply of water from Dartmoor. I find, however, that though possibly the altitude might be sufficient, yet the nature of the country does not afford those facilities for storing water which are to be found in Wales; and certainly its distance from the Metropolis would be much greater than from the valley of the Wye.

From this brief summary of schemes which have been proposed in the past, the Committee will, I think, gather my reasons for not adopting any of them on the present occasion. But the fact that they have been proposed, and that portions of them have been appropriated by other large towns, teaches that the valuable watersheds of the country suitable for the supply of the Metropolis are gradually being acquired by other municipalities.

Conclusion.

In conclusion, I hope that my endeavours to lay before the Committee a scheme of water supply suitable for the Metropolis outside the Thames basin will meet with their approval. I can assure them that during the four months which have elapsed since the issue of their order on the 16th of February last I have spared no time nor trouble to place the matter before them in a concise and reliable form. The work has required much designing and calculation, both as to the yield of the ground and the proper disposition of the reservoirs to economically store the water obtained; and the working out of long lines of aqueduct to London has been a subject involving much detailed consideration.

In this work I have been zealously assisted by Mr. Seymour Rumble and the staff of the Water Department engaged under him; and it would have been impossible for me to comply with the request of the Committee had I not been so fortunate as to have associated with me Mr. Hassard, M.Inst.C.E., who has placed at my disposal many sections and much valuable information accumulated during the past 25 years, over which period he has been continually at work on London Water Supply. To Mr. G. F. Deacon, M.Inst.C.E., I am also indebted for the care and attention with which he has checked many of my most important calculations; but neither of these gentlemen must be held responsible should any errors have crept into the work on which we have been engaged.

Following the Chief Engineer's report is one by the Chemist (Mr. W. J. Dibdin, F.I.C., F.C.S.) on the quality of the waters proposed to be taken, accompanied by tabulated analytical details.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Mr. Mackenzie, a member of the Edinburgh Corporation, has just raised a question regarding the illuminating power of the gas supplied from the Edinburgh Corporation Gas-Works, of which more will be heard. At a meeting of the Town Council on Tuesday, he stated that he was in Liverpool on the previous Friday, and that, in the Corporation Buildings there, he was informed that a deputation from the Liverpool Corporation had paid visits to a number of towns for the purpose of testing the gas in those places. Edinburgh was visited on Aug. 4 and 5; and tests were made in the Balmoral Hotel, by an expert who accompanied the deputation. He was shown a sheet which indicated that the illuminating power of the Edinburgh gas was, with a standard burner, 20·65 candles; and with an ordinary burner, 16·48 candles. He found that the result of tests by the Official Gas Examiner in Edinburgh (Mr. J. Falconer King) on Aug. 7, was 24·90 candles. He was not alleging that Mr. Falconer King's figures were wrong; but he wished to point out the discrepancy. At present, he said, Mr. King had to give twenty-four hours' notice to the Gas Commission when he was about to test the gas; and he (Mr. Mackenzie) thought that if the Examiner could test it when and where he pleased, the public would have more confidence. Bailie Kinloch Anderson, who is Convener of the Works Committee of the Gas Commission, said the statement was a most alarming one; but he entirely discredited it. They had analysts in the works at Edinburgh and at Leith, besides the City Analyst; and he asked if it was to be supposed that the whole three were wrong. He did not know whether the Liverpool specialist made his test before or after dinner; but it was an entire falsehood. Mr. Mitchell Thomson condemned the practice of giving notice of proposed testings to the Gas Commission. Mr. John Jamieson said it seemed to him that Mr. Mackenzie always tried to get a better market for his electric light by decrying the quality of the gas. This Mr. Mackenzie indignantly denied. The Lord Provost said he would have the subject looked into by the Gas Commission, and the conversation ended.

Now, to begin with Mr. Jamieson's remark, it is the case that Mr. Mackenzie is the Convener of the Electric Lighting Committee of the Corporation; and in that capacity, as these "Notes" have before shown, he has displayed an enthusiasm on behalf of the subject under his charge which would have done him credit if he had been pushing it for pecuniary advantage to himself, and not merely as a duty laid upon him as a public representative. It does look as if the raising of this question about the gas would have been better in the hands of some other member of the Corporation. But then Mr. Mackenzie is a conscientious man; and the information having come into his hands, the responsibility lay upon him of bringing it forward. I should say that so important a subject having been introduced to his notice, it was his duty to call attention to it. At the same time, I quite believe that he experienced more joy than any other feeling at being able to have a dig at the Gas Commission.

But while Mr. Mackenzie must be held to have acted quite straightforwardly, what is to be said of the action of the Liverpool Corporation? There was, morally, nothing wrong, or even admitting of objection, in their endeavouring to satisfy themselves as to the quality of gas supplied in different towns. To come into a town, however, and begin on a Sunday (for Aug. 4 was a Sunday) to make tests of the gas, and to depart with the results in their pocket, having in their minds the knowledge that something was wrong somewhere, but not seeking to find out what it was—making a sort of snap-shot test, and regarding the result of it, notwithstanding its divergence from other tests made in a careful manner by competent men, as being sufficient, and seeking no information which might explain the discrepancy—was not what was to be expected from a body of English gentlemen. But to do all this, and without giving the Edinburgh and Leith Gas Commissioners an opportunity to furnish what explanation might be possible, to disclose the result in the way they did, was, I must say, as huge a piece of "sneaking" as ever came under my notice. It is difficult to understand what could have been the motive for the secrecy of the test; it is still more difficult to understand why, if secrecy was necessary, the result should have been published at all, or, if published, why it should have been made surreptitiously to one member of the Edinburgh Corporation, and not honourably to the Gas Commission. Surely all the people in Liverpool are not as the members of this deputation. The deputation must have started on their tour with the suspicion that the published results of official testings were not accurate; else why leave home at all. Their suspicions must, in fact, have extended to the gas,

the instruments for testing it, and the Official Examiners, for they took an examiner and a photometer with them. To minds so constituted, the Edinburgh results surely must have brought happiness. If the whole Corporation are to share in the happiness, they must shut their eyes to a great deal. For instance, they must not recognize, or acknowledge to themselves, that all this clandestine testing of gas is of no avail in any sense whatever. They cannot use the figures they have obtained, because Parliament has prescribed that gas shall be tested in a certain manner, at certain places, and by particular persons, and that the results are to be taken as evidence. No tribunal, therefore, would accept the figures of the Liverpool expert. Even in private negotiation, they would not be accepted, in face of the overwhelming testimony of the regular Examiners.

On other grounds, the movement was a piece of folly. It is common knowledge to everyone acquainted with gas matters that the testing of the illuminating power of gas must be performed under very strict conditions. In Edinburgh it has to take place at 25, Waterloo Place, and is to be conducted with a union-jet burner, and with the gas at 5-10ths pressure. It is extremely doubtful if these conditions could be complied with in a hotel, with temporary appliances. The pressure, for one thing, in the mains, is, from sunset to midnight, 8-10ths, and for the rest of the 24 hours, 6-10ths. I presume that the pressure was not what is prescribed, and that the prescribed burner was not used; and these two things would quite account for the difference in the illuminating power. But, on this point, it may be better to wait till it be seen whether any explanation is to be given regarding the conditions under which the tests were made.

Returning to what took place in the Edinburgh Town Council, it is the fact that notice is given by the Examiner of the time when he proposes to test the gas. Two members of the Corporation condemned the practice; and a local newspaper writer waxed wroth over it, and asked the question whether, if notice were to be given to milk-sellers, any would be found watering. On the face of it, it does look strange that notice should be given before the arrival of the Examiner; but it is better not to speak too rashly. The testing of gas is a statutory proceeding; and though no mention is made in the statute (the Gas-Works Clauses Act, 1871) of notice being given, that Act provides that the owners of the gas undertaking may, if they think fit, be represented by some officer, at the testing; and, how are they to be represented, unless they get notice to attend? Without compliance with the statute, the test would be void; and therefore notice must be given. If the Town Council wish to act the part of detective, there is nothing to prevent their obtaining an independent test from another examiner. But such a proceeding would imply distrust of the Official Examiner; it would, in fact, be based on the reasons which led to the Liverpool expedition, and would, among honourable men, be altogether out of the question. That the Gas Examiner should make his tests at any time, and at any place he may choose, is a fine sounding phrase; but it is impracticable. Happily, in these islands, a person is held to be upright until something to the contrary is proved against him; and that doctrine applies to the makers and sellers of gas. There are some, however—and these Liverpool deputationists seem to be among them—who think that those who supply gas should be held to be rogues until it can be established that they are honest men. In this instance, I look with confidence to their discomfiture.

The annual accounts of the Aberdeen Corporation Gas Department, to which I referred last week, were submitted to a meeting of the Town Council on Monday, and were adopted unanimously. Mr. Johnston, the Convener of the Gas and Electric Lighting Committee, in presenting them, said that as last year's report was only for a period of ten months, a comparison could not be made. The year had, however, been a most successful one. The new gasholder at Gallowhill was now completed, and was at present being filled with gas. The holder was the second largest in Scotland. Its construction had, from the very commencement, gone on without a single hitch; and the work was, in every way, a credit to all concerned. They had purchased coal for the current year on about as favourable terms as last year; and the price of gas was the cheapest they had ever had. Mr. Johnston entered into a comparison with the Dundee Corporation Gas Department, pointing, with satisfaction, to the circumstance that, although, from the longer carriage, they paid 2s. 7d. per ton more for their coal, and had no meter-rents (which in Dundee realized £3000 a year), they were able to sell gas at the same price as in that town. If they had meter-rents in Aberdeen, it would mean another 2d. per 1000 cubic feet upon the price of gas. He would like to call the attention of the Council to the financial position of the gas undertaking, as compared with what it was when they acquired it in 1871. The value then was £114,933; and since then there had been added works at the cost of £164,600, making a total of £279,500. Of this sum, however, no less than £126,300 had been repaid, leaving as the present book value £153,000, or only £39,000 more than in 1871; while the works produced now three times the quantity of gas they were capable of manufacturing then. The figures he had given (£153,000) as being the present value of the gas-works represented, of course, the book value only. As a quarter of a century nearly had elapsed since the Council became owners of the works, he considered it would be well to have a new valuation; and he should bring the matter under the notice of the Gas Committee with the view of submitting a proposal to that effect. They had last year contributed to the reserve fund £957. It stood now at £17,395; and it would, in less than three years, amount to £20,000. This, he thought, would be quite large enough; and when it had been reached, they might call a halt. I may say that I had the pleasure, this week, of meeting Mr. Alex. Smith, the Gas Engineer to the Corporation; and I learned from him that during the past year the output of gas increased by 20 million cubic feet. This is most satisfactory, Mr. Smith is in a most cheerful frame of mind; and with good reason, seeing he has just seen the end of his labours in connection with the large new gasholder on the Links, which he has engineered from start to finish, and which is turning out such a success. I had a glimpse of the holder; and it is a masterpiece of work. It has also the great merit of being, if I am not mistaken, the lowest in point of cost of construction of all the large gasholders in the United Kingdom, which says a great deal for Mr. Smith's capabilities as an Engineer.

It is with pleasure that I record the circumstance, which has just come under my observation, that the adoption of the patent regenerative settings invented by Mr. G. R. Hislop, of Paisley, is extending rapidly, both in England and Scotland. The following installations have just been completed: A bench of 48 retorts at Kidderminster; of 28 retorts at Beverley; of 64 retorts at Falkirk; of 32 retorts at Helensburgh; of 28 retorts at Selkirk; and of six retorts each at Largs and Nantwich; while an extension of the system is being made at Waltham Cross.

I am sorry to see that the Dundee Corporation Gas Committee are coquetting with a proposal to let their street lamp pillars for advertising purposes. The Company who have approached the Committee make the curious offer of 3d. per head of the population per annum, which would amount to £1983. I regard the system as objectionable. It is not altogether legitimate gas business.

The shareholders of the Carnoustie Gaslight Company held their annual meeting on Wednesday. It was reported that the net profit for the year was £424, out of which a dividend at the rate of 7½ per cent. was paid, which absorbed £375; and the balance was added to the contingency fund. This fund will require some assistance, as, it will be remembered, the works were all but destroyed by a gale at the end of 1893. The Chairman of the meeting stated that a new chimney had been erected, and that the retort-house had been enlarged and improved. The price of gas was reduced from 5s. 5d. to 5s. per 1000 cubic feet.

The Montrose Gaslight Company have this week reduced the price of gas for lighting purposes from 4s. 7d. to 4s. 5d. per 1000 cubic feet; and for cooking and heating, to 4s. 2d. The charge for public lighting has also been lowered from 11s. to 10s. 6d. per lamp per annum.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 7.

Sulphate of Ammonia.—September has opened quietly; buyers for the most part holding off, and there being no great pressure on the part of makers to sell. The only firmness apparent is at Leith, on the strength of a threatened strike at the shale works—the source of the bulk of the Scotch production. The question between masters and men is still pending. Failing an amicable settlement, some temporary improvement in sulphate may be looked for. Meantime, the quotation, f.o.b. at the ports, is £9 5s. per ton. Forward business is still being done by speculators, who are offering £9 15s. for delivery in the early months of 1896.

Nitrate of Soda is quiet, at 8s. per cwt. for fine quality on spot.

LONDON, *Sept.* 7.

Tar Products.—Pitch is firm; and the improved value looks as if it will be maintained, at any rate for the coming season. There is not much new business being done in benzol; but the value continues firm. The production of benzol has not realized the anticipation of some of the "bear" operators of this article. Indeed, there are no stocks of benzol in this country anywhere; and, if report is true, it is stated that Continental buyers have allowed their stocks to become inordinately small, in the expectation of being able to replace them at very low prices. Compared with this time last year, the price is now much lower; but there can be little doubt that the bottom value has been reached, and any movement will be in an upward direction. Great dulness characterizes the market for creosote and oils. Solvent naphtha is more sought after; and toluol, which is now being largely used for solvent purposes, is also in fair request. Carbolic acid and cresylic acid are both firm; and, with little being produced, values may quite easily be increased. Anthracene is said to be weak; and undoubtedly some outside parcels have been sold below the Committee prices. The following values have obtained during the week: Tar, 18s. to 23s. Pitch, west coast, 35s. 6d.; east coast, 38s. Benzols, 90's and 50's, 11¼d. Solvent naphtha, 1s. 0½d. Toluol, 1s Crude, 30 per cent. naphtha, 4⅝d. Liquid creosote, 1¼d. Naphthalene salts, 24s. Cresylic acid, refined, 1s. 1½d.; brown, 10½d. Carbolic acid, 60's, 1s. 6d.; 75's, 1s. 9d. Anthracene, nominal "A," 1s.; "B," 9½d.

Sulphate of Ammonia does not improve in price; but the market is very steady, and considerable business is being done. It is reported that a large reduction in stocks, which have been held for a rise, has taken place. There is a healthy tone about this market, which is likely to develop into considerable strength. Transactions during the week have realized: London, £9 2s. 6d. to £9 5s. Liverpool, £9 3s. 9d. to £9 6s. 3d. Hull, £9 2s. 6d. Leith, to £9 5s. Tyne, £9 2s. 6d.—all, excepting "Beckton terms," less 3¼ per cent. f.o.b., bags included. Nitrate of soda is reported weak; and this is undoubtedly the disturbing influence that prevents sulphate realizing a better price, notwithstanding the fact that sulphate, from a nitrogen point of view, is still much cheaper than nitrate at to-day's values. Gas liquor is quoted at 6s. 6d. to 7s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—What further particulars I can gather with regard to the Salford gas-coal contract, bear out what I have previously stated—that the bulk of the coal has been secured at exceptionally low figures. One of the leading Manchester collieries has, however, obtained a fair proportion of the contract at what they consider a satisfactory price—certainly considerably above what it is reported other collieries have accepted. But they are in the position of being in close proximity to the works, and under very small cost as regards delivery. The prices they obtained for gas nuts, delivered by cart, was equal to 8s. 6d. per ton at the works, which is about 2s. per ton above the prices reported to have been taken for Arley nuts delivered by rail at Regent Road. But in the latter case the price, of course, was exclusive of carting; and this to some extent may account for the higher figure obtained by the Manchester firm for a similar class of coal. With regard to other descriptions of fuel, the position remains much as last reported; there being still an absence of any

development of the usual winter demand for house-fire purposes. The better qualities of round coal meet with only a very slow sale, with pits not working more than three to four days per week. Prices which are usually expected to show some upward move at this time of the year, are not more than maintained at late rates. They average 10s. to 10s. 6d., per ton for best Wigan Arley; 8s. 6d. to 9s., for Pemberton four-feet and seconds Arley; and 7s. to 7s. 6d., for common house coal at the pit mouth. The lower qualities of round coals, suitable for steam and forge purposes, are in but limited demand, and continue quite a drug upon the market, with prices weak and irregular. Ordinary steam and forge coals do not fetch more than about 6s. to 6s. 6d. per ton at the pit mouth. Engine fuel meets with only an indifferent inquiry; the holiday stoppages in the surrounding manufacturing districts still considerably interfering with requirements for this class of fuel. Prices remain at about 3s. and 3s. 6d. for common to 4s. 6d. and 5s. for best qualities, at the pit, with contracts for some of the inferior descriptions taken at 6d. to 1s. less, and slack offering from other districts at very low prices. A moderate business is being done for shipment, in house-fire qualities—chiefly for Ireland and the west coast; and about 9s. 6d. is being obtained for good seconds qualities, delivered either at the ports on the Mersey or the Manchester ports. There is still, however, only a small demand for steam coals, which (for delivery at the High Level, Liverpool, or the Garston Docks) are not fetching more than 7s. to 7s. 6d. per ton.

Northern Coal Trade.—An irregular increase in the demand for coal has developed during the last week or so; and in one or two cases, collieries have been able to ask rather higher prices. But, generally speaking, the better demand has been readily met by working fuller time at some of the pits; so that the maintenance of prices is the utmost that can be expected. Best Northumbrian steam coals have been in demand for shipment, as the exporting season becomes shorter now; and the price may be quoted as about 9s. per ton, f.o.b. Second-class steam is obtainable at from 8s. to 8s. 3d. per ton; and small steam coal is in fairly good demand at from 3s. 3d. to 3s. 6d. There has been a better demand for bunker coals during the last few days; and in one or two cases a rather higher price has been asked. But good unscreened qualities may be had at 6s. 3d. per ton, f.o.b.; and from that up to 8s. 6d. per ton, f.o.b., for the best screened bunkers is asked. Manufacturing coal generally is quiet; but there is a better demand for coking coal. Household coal is naturally in limited demand; and the price is very weak, except for shipment, where the unaltered figures of 10s. per ton, f.o.b., are still current. In regard to gas coals, there is a decided increase in the amount sent out both for shipment and for local consumption; and there is a considerable enlargement of the quantities supplied under the contracts with the great gas companies. Prices do not show very much alteration in this kind of coal; for the great bulk of the deliveries are under contract. For odd cargoes, the quotations vary from 6s. 3d. to 6s. 9d. per ton, f.o.b.; but for forward delivery the disposition is to ask higher prices. The improvement in the local iron-trade is enlarging the demand for coke, and causing a stiffening in the price, which, if continued, will affect the future quotations for several kinds of Durham fuel. Best coke is quoted 13s. to 14s. per ton, f.o.b., with higher rates for future delivery, as there is a desire on the part of users to anticipate their demands as much as possible. Gas coke is in a little fuller supply, and is well taken up for local use and export. The price shows no alteration this week.

Scotch Coal Trade.—There is at present a good demand for coal, particularly in the west of Scotland, where the miners are getting full work. In Fifeshire, the demand is not so good; the Baltic connection having been lost last year, and not quite returned. This is keeping down prices, which otherwise would be better. As it is, there is little variation in the quoted prices, though, in some instances, splint is spoken of as 2d. per ton dearer. The miners are likely soon to be asking for an increase of wages; but, it is reported, the masters will refuse it, which may lead to trouble. The shale miners are agitating for a rise of wages, which the masters are declining to give; and a strike is threatened, but is not likely to take place. Taken all round, the market for coal is improving. The prices quoted are: Main, 6s. to 6s. 3d.; ell, 6s. 9d. to 7s.; splint, 6s. 6d. to 6s. 9d.; and steam, 7s. 6d. to 7s. 9d., f.o.b., Glasgow. The shipments for the week amounted to 171,878 tons—a decrease of 10,093 tons, compared with the previous week; but an increase of 163,319 tons, compared with the corresponding week of last year. For the year to date, the total shipments have amounted to 4,804,726 tons—an increase of 1,337,294 tons, compared with the same period of last year.

Hiring and Sale of Gas-Stoves, &c., in Glasgow.—According to the last report made to the Glasgow Corporation Gas Committee on the hiring and sale of gas-stoves, kitchen range fittings, &c., the total number of hired goods at the close of July was 12,496; and the sales of stoves, range fittings, gas-fires, burners, &c., from the commencement of the stove-hiring scheme, amounted to 18,056.

The Large Loan for the Leeds Corporation Water Department.—A resolution was proposed by Alderman Cooke at last Wednesday's meeting of the Leeds City Council, empowering the Water Committee to make application to the Local Government Board for sanction to borrow £100,000 for water-works purposes. He said that this money was required to meet the demands of the city in relation to the water supply. The extensions needed comprised a new 30-inch main from Swinsty to Eccup, the new pumping-engines at Headingley for the high-level supply, and the new service reservoirs at Harehills and Beeston for low-level supplies. The estimated expenditure for the three years ending March, 1898, were as follows: Eccup reservoir, completion of No. 2 contract, £15,000; completion of No. 3 contract, £22,000; pipe-line from Arthington to Swinsty, £34,000; the new engines for the Headingley pumping-station, £10,000; and ordinary extensions, £18,000. Alderman Cooke also mentioned that during the year eleven miles of new mains and service-pipes had been laid, principally to new property; and that the new supplies of water in 1894 numbered 5687. The net profit for last year amounted to £7365; and those for the past seven years, to £50,198. The resolution was adopted.

Fenton District Council Gas Department.—The annual report of the Gas Committee of the Fenton District Council was submitted at the last meeting by Mr. G. Hallam. It showed an increase of £466 in the gas-rental, which was attributable chiefly to prepayment meters. The total increase in the receipts was £650. The gross profits amounted to £3715, or £683 more than last year. Interest and redemption of loans cost £2640; the net profit being £1074—an increase of £683 upon last year. This added to £4003, the amount accumulated out of profits in previous years, made £5077, which the Committee had resolved to deal with as follows: £500 to a reserve fund; £577 to the credit of the district fund; and £4000 to carry on the undertaking. The amount of capital now paid off was £4340. Mr. Hallam stated that the Committee would discuss the advisability of reducing the price of gas. Personally he thought that the ratepayers ought not to have all the benefit of the gas-works, but that the consumers were entitled to consideration. The Chairman (Mr. E. Brain) considered the report was a very satisfactory one, and said he thought the Council might congratulate themselves upon the way the gas-works were managed.

Incandescent Gas Lighting at Ipswich.—At the last meeting of the Paving and Lighting Committee of the Corporation of Ipswich, the Gas Inspector (Mr. E. C. Sayer) presented a report in which he estimated that the saving in gas on the twelve large special lamps being fitted with incandescent burners in lieu of governor burners would be 497,670 cubic feet per annum. From this should, he said, be deducted £17 10s., the probable annual cost of renewal of mantles and mica chimneys, and there would still be a saving of £10 16s. 8d. He estimated that the first cost of substituting incandescent burners for the present governor burners would be about £21 17s. 6d. If this were carried out, it would leave only 185 3½-feet lamps with the old form of burner, and these consumed too small a quantity of gas to effect any saving. Mr. G. F. Josselyn gathered that the prime cost would be £21, and they would save £10 a year—the Gas Company bearing the expense of the renewal of mantles and so on, because they had at present to keep the lamps and burners in order. The Inspector said the Committee did the whole of it; and he thought the figures would cover the cost. He added that he proposed to put a cluster of three burners in lieu of each of the large lamps. They would make a saving of £9 out of £30, and give a considerably better light.

The Public Lighting of Canterbury.—The Street Lighting Committee of the Canterbury Town Council made two recommendations at the meeting of that body last Wednesday regarding the lighting of the city. Being of opinion that the time has arrived for the introduction of the electric light, they recommended, first, that Mr. Robert Hammond be retained to advise upon the whole subject; and, secondly, that the present gas contract be continued for one year on condition that the Gas Company supplied all the ordinary lamps with Goodson's governor burners, to consume 6 cubic feet per hour, at the same price per lamp as that now paid. The adoption of the report was moved by Mr. Warren, who, if he desires that smooth relations shall exist between his Committee and the Gas Company, would have done well to have used somewhat more moderate language when speaking of them. Having expressed his belief that the Council could supply the electric light at a reasonable price, and make a profit out of it, he said he thought, when the Gas Company saw they were determined to have a better light at a lower rate than at present, they would alter their prices. Considering the miserable "rushlights" they had throughout the town, it was time they lightened their darkness. The Gas Company had told them that the price of their gas compared favourably with other towns; but they must show them that they would not submit to their prices any longer. Among the other speakers was Mr. Lukey, who felt the Council would all agree that they must have a better light; but the Gas Company, though they had been approached on the subject, did not see their way to give them that light. Alderman Hart (a Director of the Company) contradicted this statement, and said they would be pleased to give the Council a better light on a cheaper basis. He suggested that the Council should have a conference with the Company, and discuss the matter. Alderman Cross proposed that this should be done; but, on a vote being taken, the recommendations of the Committee were adopted.

The Purchase of the Odessa Water-Works by the Municipality.—The Directors of the Odessa Water Company have convened an extraordinary meeting of the shareholders, for the purpose of finally deciding upon the sale of the undertaking to the Municipality of Odessa. In regard to the proposed terms of purchase, the Board, through the Chairman, have previously assured the shareholders that they would keep before them, as a Board, the 44th clause of the concession as the basis of sale, which would give the Company twenty years' purchase of the average annual net income of the preceding five years. They now admit that they were too sanguine in their construction of the proposed terms; and they agree that the view expressed by Mr. Blunt, at the meeting of the shareholders on April 29, was the correct one—viz., that "the offer to the Company was a sum capitalized equal to the profit for the remaining years of the concession." The net result will give as the purchase price about £380,000; and the Directors, while preferring that the "lump sum" should be paid down, are not disposed to take exception to the proposed half-yearly payment pending the raising of the necessary loan by the Municipality, providing such payments are limited to the period of two years dating from the 9th (21st) of September, 1895, this being also the date fixed by the Commission for the acceptance, or otherwise, of the terms now offered to the Company; and it being understood that the balance of the "lump sum," as defined by the Commission, shall be paid on or before the 9th (21st) of September, 1897. The Directors are unanimously of opinion that the terms as defined by the protocol should be accepted by the Company. Two of the Company's shareholders have written to a financial contemporary, advising their fellow-shareholders to pause before assenting to the sale of the concern, upon the terms offered by the Municipality. These are considered "illiberal;" and one of the correspondents (Mr. W. Fox Batley) asserts that the shareholders have been deceived by the Directors, as the Chairman stated, at the last meeting, that they would get about £7 for each £20 share. The present offer is far below this.

Exhibition of Gas Appliances in Dublin.—An exhibition of gas cooking and heating appliances was opened last Tuesday in the Alliance and Dublin Gas Company's Hall, in Hawkins Street, Dublin; the exhibits being mainly manufactured by Messrs. John Wright and Co., of Birmingham. Lectures have been delivered each afternoon and evening by Mrs. J. B. Thwaites, the Principal of the Liverpool School of Cookery; and these will be continued another week.

The Cost of the Opposition to the Felixstowe Water Bill.—The costs, charges, and expenses in connection with the opposition of the Felixstowe and Walton District Council to the local Water Company's Bill amount, including the preliminary costs of promoting a proposed Bill in 1894, to £820 8s. 8½d. Some of the members of the Council are desirous of learning how the money was spent; and a Committee have been requested to look into the matter, and report thereon.

A Gasholder Accident at Providence.—The *Globe* gave publicity last Thursday to the following report: "A gasholder at Providence, Rhode Island, 'exploded' on Wednesday with terrific force. A corset factory in close proximity suffered severely. A portion of the wall of the building was destroyed; and one of the floors was practically blown out. Five men employed in the factory were killed outright; and several others were severely injured." We shall look forward with interest to the receipt of next week's technical papers from America, which will probably contain some confirmation or contradiction of the above.

Nottingham Corporation New Water-Works.—There was considerable discussion at the meeting of the Nottingham Town Council yesterday week upon a report by the Water Committee as to the inclusion of the parishes of Oxton, Calverton, Woodborough, Lambley, Burton Joyce, and Radcliffe-on-Trent in the district of the water undertaking. Mr. Sands moved the adoption of the report, and pointed out that the Committee had selected a site in the neighbourhood of these parishes for new water-works; and they thought it would only be doing what was right if they supplied the parishes with water. The motion was agreed to.

Fire at Messrs. Sadler and Co.'s Chemical Works.—On the night of the 30th ult., a fire occurred at the chemical works of Messrs. Sadler and Co., of Middlesbrough; and but for the timely action of the night-shift workmen and the local fire-brigade, the results might have been disastrous. The outbreak had its origin in one of the pits used for the storage of alizarine; and the material being of an exceedingly inflammable nature, there was at once a glare of light which attracted some hundreds of people to the scene. The fire-brigade were on the spot within a few minutes of receiving the alarm; and their ready efforts confined the flames within an area of a few square yards. Colonel S. A. Sadler was on the scene shortly after the outbreak was discovered.

The Tunnel at Dawsholm Gas-Works, Glasgow.—The Glasgow Corporation Sub-Committee on Works recently had submitted to them a plan of a diversion which the Engineer (Mr. W. Foulis) proposed should be made upon a portion of the tunnel which connects the Dawsholm Gas-Works with the Temple Gas-Works, formerly belonging to the Partick, Hillhead, and Maryhill Gas Company. Many Scotch gas managers know that tunnel well; and they remember that it passes under the Bowling branch of the Forth and Clyde Canal, and gives railway connection between the two works. The plan has been approved of by the Works Sub-Committee; and the Engineer has been authorized to have the work carried out, at an estimated cost of £1500.

Embezzlement by an Official of the Gas Workers' Union.—Last Thursday, at the West Ham Police Court, Edward Parfitt was charged with embezzling three sums, amounting to £1 17s., the moneys of the Trustees of the Gas Workers' Union; and also with forging and uttering receipts for the three sums. Prisoner was the Secretary of the Richmond branch of the Union. When first brought before the Court, on the previous Monday, Mr. Baggallay said he would commit him for trial for embezzlement and forgery, but formally remanded him. His Worship now, however, asked the prisoner to consider his position, and to say if he would have the case dealt with, or if he would prefer to go for trial. Prisoner expressed a preference for the latter course; but on Mr. Baggallay reminding him that there was the charge of forgery to be dealt with, prisoner decided to have the case settled then. Mr. George, for the prisoner, said he had paid over all the money he had been paid. Very foolishly he had given credit to members and signed their cards for money he never received. As to this 37s., there was no evidence that prisoner ever did receive it. Mr. Baggallay said the case was very clear; and, in law, the evidence disclosed forgery. Prisoner had now pleaded guilty to embezzlement; and, under all the circumstances, he would be imprisoned for a month.

A Substantial Reduction in the Price of Gas at Accrington.—An item of £137 for street lighting, in the minutes presented by the Watch and Cemetery Committee at the meeting of the Accrington Town Council last week, was regarded by Mr. Broughton as a very large one for the summer months; and he asked whether there was to be any reduction in the price of gas before long. He complained that the Council obtained very little information as to the proceedings of the Gas and Water Board. The Town Clerk replied that the announcement had already been semi-officially made, that the gas was to be reduced 3½d. per 1000 cubic feet to ordinary consumers and 4d. to the local authorities; so that the price for street lighting would now be 2s. 6d., instead of 2s. 10d.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 630.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	23½–24½	..	4 5 8
100,000	10	,,	7½	Do. 7 p. c.	10	16–17	..	4 8 3
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	108–110	+2	4 10 11
200,000	5	1 May	6½	Bombay, Limited	5	7–7½	..	4 6 8
40,000	5	,,	6½	Do. New	4	5–5½	..	4 14 7
380,000	Stck.	14 Aug.	12	Brentford Consolidated	100	253–258	..	4 13 0
180,000	,,	,,	9	Do. New	100	200–210	..	4 5 8
220,000	Stck.	14 Mar.	11	Brighton & Hove Original	100	227–232	..	4 14 10
933,500	Stck.	29 Aug.	5	Bristol	100	125–130*	..	3 16 11
320,000	20	28 Mar.	11½	British	20	54–56	..	4 0 4
50,000	10	29 Aug.	11½	Bromley, Ordinary 10 p. c.	10	21½–22½*	..	5 2 2
51,510	10	,,	8½	Do. 7 p. c.	10	16½–17½*	..	4 17 1
328,750	10	12 June	4	Buenos Ayres (New) Limited	10	7½–8½	..	4 14 1
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	101–104	..	5 15 5
150,000	20	11 July	8½	Cagliari, Limited	20	31–33	+2	5 0 0
550,000	Stck.	10 Apl.	13½	Commercial, Old Stock	100	300–305	..	4 8 6
165,000	,,	,,	10½	Do. New do.	100	225–230	..	4 11 4
160,762	,,	12 June	4½	Do. 4½ p. c. Deb. do.	100	143–147	..	3 1 3
800,000	Stck.	12 June	13	Continental Union, Limited.	100	270–280	..	4 12 10
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	207–212	+4	4 14 4
535,000	Stck.	29 Aug.	5½	Crystal Palace Ord. 5 p. c. Stk	100	125–130*	..	4 0 9
486,090	10	26 July	11	European, Limited	10	25–26	..	4 4 7
354,060	10	,,	11	Do. Partly paid	7½	17–18	..	4 14 3
5,646,590	Stck.	14 Aug.	12½	Gaslight & Coke, A, Ordinary	100	292–297	+1	4 5 10
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	107–112	..	3 11 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	280–285	..	3 10 2
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130–135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	197–202	..	3 14 3
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	187–192	..	3 12 11
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	277–282	..	3 10 10
476,000	,,	,,	6	Do. K, 6 p. c. Prf.,	100	163–168	..	3 11 5
1,061,150	,,	12 June	4	Do. 4 p. c. Deb. Stk.	100	131–134	..	2 19 9
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	140–145	..	3 2 1
908,000	,,	,,	6	Do. 6 p. c. do.	100	202–207	+2	2 17 11
3,800,000	Stck.	10 May	12	Imperial Continental	100	248–253	..	4 14 9
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	5½–6½	..	4 16 0
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p.c. Deb.	100	115–117	..	4 5 6
541,920	20	12 June	5	Monte Video, Limited	20	17½–18½	..	5 8 1
150,000	5	24 May	8	Oriental, Limited	5	7¼–7¾	..	5 3 2
60,000	5	28 Mar.	7	Ottoman, Limited	5	5–5½	..	6 7 3
166,870	10	14 Feb.	2	Para, Limited	10	1½–2½	..	8 0 0
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	102–106	..	5 13 2
500,000	100	4 June	6	2nd Do.	100	100–105	..	5 14 3
150,000	10	26 Apl.	7	San Paulo, Limited	10	10–11	..	6 7 3
500,000	Stck.	29 Aug.	15½	South Metropolitan, A Stock	100	360–370*	..	4 3 9
1,350,000	,,	,,	12	Do. B do.	100	302–307*	..	3 18 2
308,685	,,	,,	13	Do. C do.	100	315–325*	..	4 0 0
800,000	,,	11 July	5	Do. 5 p. c. Deb. Stk.	100	174–177	..	2 16 6
60,000	Stck.	28 Feb.	11½	Tottenham & Edm'nton, "A"	100	230–235	..	4 17 10
				WATER COMPANIES.				
746,021	Stck.	26 June	10	Chelsea, Ordinary	100	290–295	..	3 7 10
1,719,514	Stck.	10 Apl.	8	East London, Ordinary	100	224–228	..	3 10 2
654,740	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	157–162	..	2 15 6
700,000	50	26 June	7	Grand Junction	50	117–122	..	2 17 5
708,000	Stck.	29 Aug.	12	Kent	100	303–308*	..	3 17 11
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	100	258–263	..	2 17 0
406,200	100	,,	7½	Do. 7½ p. c. max.	100	208–213	..	3 10 5
330,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	145–150	..	2 13 4
500,000	100	14 Aug.	12⅝	New River, New Shares	100	385–395	..	3 2 9
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	143–148	..	2 14 2
902,300	Stck.	12 June	4	S'thwk & V'xhall, 10 p.c. max.	100	150–155	–3	2 11 8
126,500	100	,,	4	Do. D 7½ p.c. do.	100	140–145	..	2 15 2
1,155,066	Stck.	12 June	10	West Middlesex	100	290–295 *Ex div	..	3 7 10

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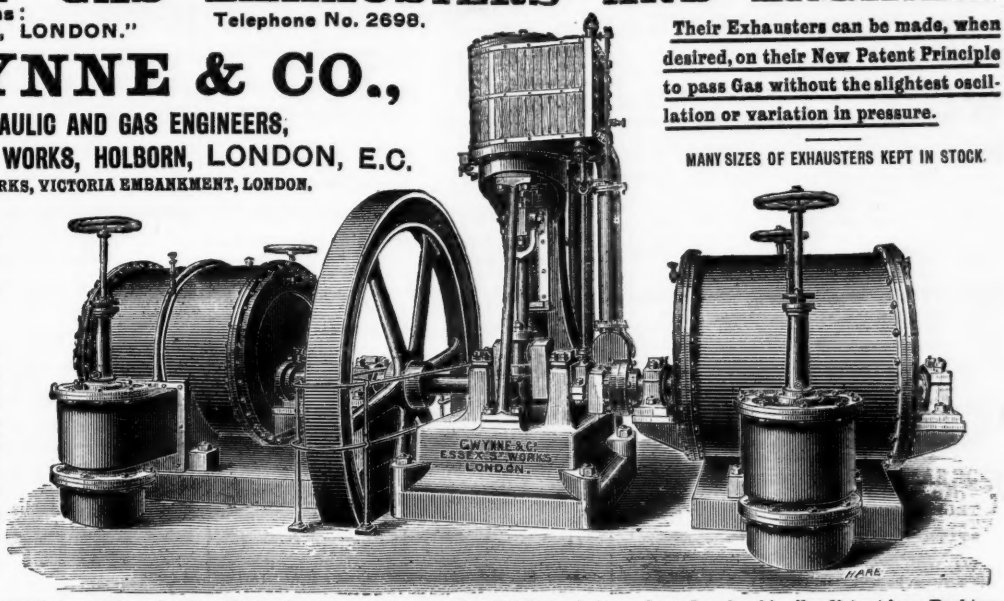

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS. Correspondence invited.

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See last week, p. 511.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

BACK-PRESSURE IN PURIFIERS.

THE Valve invented by Mr. Cripps for Bye-Passing any Layer of Purifying Material referred to by the President of the Incorporated Institution of Gas Engineers in his Inaugural Address) can be obtained of the Makers: C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP, and J. EVERY & SON, Phœnix Iron-Works, LEWES, to which Firms all inquiries should be addressed.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS, MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office MIDDLESBROUGH. Correspondence invited.

WANTED, a Situation as Stoker in a Small Gas-Works. Capable of looking after Engine and Exhauster. Shovel charging preferred. Married; Age 30.
Address No. 2565, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A MANAGER of a Gas-Works making 20 Million Cubic Feet per annum, desires to improve his position as MANAGER or ASSISTANT in a larger Works, either at home or abroad. Fourteen years' practical experience in every branch, including the Manufacture of Sulphate of Ammonia, and Secretarial duties. Age 30. Good Testimonials.
Address No. 2563, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two Stokers. None but good Men need apply. Wages 29s. to 31s. per week.
THOS. WEBB, Gas-Works, SLOUGH.

WANTED, an Agent for the Sale of Gas- Retorts and Fire-Bricks, &c., in London and District.
Apply, by letter, with all particulars, to No. 2552, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

INDEX TO VOL. LX. OF "JOURNAL."

ANY Subscribers, having spare Copies of the above, can obtain 1s. each for them on application to No. 2560, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

THE Undersigned is in a position to supply, at the very lowest Prices, the most suitable kind of BENZOL for enriching Gas, made from Hardman's Patent Carbonization Process, of which I am the Sole Patentee. On application, I would furnish Price on the most reasonable terms; giving advice how to utilize it on the most economical method.
J. HARDMAN, Manufacturing Chemist.
Milton, Staffs.

TO ENGINEERS AND MANAGERS.

MR. J. L. FEATHERSTONE (late Chief Draughtsman to Humphreys and Glasgow) is prepared to supply complete WORKING DRAWINGS, SPECIFICATIONS, and QUANTITIES for WATER-GAS PLANT. Own design.
Also DRAWINGS, TRACINGS, &c., of COAL GAS PLANT; Specially prepared for work wanted in a hurry. Moderate Charges.
Temporary Offices: 27, FORE STREET, E.C.

CHELMSFORD GASLIGHT & COKE COMPANY.

WANTED, an experienced Working MANAGER, competent to Superintend all Departments of the Manufacture and Distribution of Gas, the working of Sulphate of Ammonia Plant, and also laying and repairing Mains, Services, &c. About 4000 Tons of Coal carbonized annually. Salary not less than £180, nor more than £200, to be fixed at time of appointment. To enter on duties not later than the 1st of November next.
For Particulars as to Duties, &c., apply, by letter, to the SECRETARY, Gas-Works, CHELMSFORD.

FOREMAN.

REQUIRED by the Bombay Gas Com- pany, Limited, for their Works at Bombay, a GENERAL FOREMAN, possessing a thoroughly practical knowledge of Carbonizing, Retort Setting, and the usual duties on a Gas-Works.
Wages, 200 Rupees per month, with House on the Works, Fuel, Gas, and Passage out and home. One who has been accustomed to Foreman's Duties and is Married preferred.
Engagement for five years.
Applications, by letter only, stating Age (not to be over 35 years) and Qualifications, accompanied by *copies only* of Testimonials (which will not be returned), to be addressed to the SECRETARY of the Bombay Gas Company, Limited, 6, Draper's Gardens, Throgmorton Avenue, LONDON, E.C., on or before the 18th inst.

WANTED, a steady Man to take entire charge of small Gas-Works (make under 2 millions). Must be able to lay Services and read Meter Indices. Good House and Garden at the Works.

Applicants must state Experience and Wages required to J. PAXTON CLARKSON, 5, GREAT WINCHESTER STREET, E.C.

USK GAS COMPANY, LIMITED.

WANTED, a competent Working MANAGER, to take charge of the Making and Distribution of Gas, take Meters, collect Accounts, and undertake all Fitting Work, including Mains and Services.

Salary, £100 per annum, with House, large Garden, Coal, and Gas free.

Applications (stating Age), with Testimonials, to be sent in to me on or before Saturday, the 28th inst.

H. A. ADDIS,
Secretary.

Usk, Sept. 7, 1895.

WANTED, a Second-hand Scrubber or WASHER-SCRUBBER, having 8-inch or 10-inch Connections, to pass not less than 100,000 Cubic Feet per day; also a WASHER of similar capacity.

Give full Particulars and Price, put on Rail, to No. 2561, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS COKE—3000 Tons for Sale, loaded into Trucks for Rail or Shipment.

Apply to H. MORLEY, Gas-Works, CARDIFF.

FOR SALE—The following Second-Hand GAS PLANT:—

TELESCOPIC GASHOLDER, 45 ft. by 18 ft.
Two TELESCOPIC GASHOLDERS, 60 ft. by 18 ft.
STATION METER, to pass 15,000 Cub. Ft. per hour, Rectangular Cast-Iron Case, by J. & J. Braddock.
WASHER-SCRUBBER, to pass 250,000 Cubic Feet per day, by Kirkham, Hulett, and Chandler, Ltd.
CONDENSERS, Annular, to pass 250,000 Cubic Feet per day, by C. & W. Walker.
STATION GOVERNOR, 12-in., by J. & J. Braddock.
ENGINE, 4-Horse Power, Steam.
74 MOUTHPIECES, 15 inch and 16 inch Round, ASCENSION-PIPES, BRIDGE-PIPES, and HYDRAULIC MAINS, &c., &c.

Most of the Plant is equal to new.

For further Particulars, apply to J. C. Belton, Manager.

By order,
A. MARSTON, Secretary.

Gas Offices, Willenhall.

COUNTY BOROUGH OF WIGAN.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Wigan Cor- poration invite TENDERS for the surplus TAR produced at their Gas-Works for One Year, commencing on the 1st of September inst., and terminating on the 31st of August, 1896.

Particulars and Forms of Tender may be obtained on application to the undersigned.

The highest or any tender not necessarily accepted.

Tenders, sealed and endorsed "Tar," to be delivered to J. J. Charnock, Esq., Town Clerk, on or before the 17th inst.

JOS. TIMMINS,
Engineer, &c.

Borough Gas-Works, Wigan,
Sept. 3, 1895.

GRAVESEND & MILTON GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company invite TENDERS for the supply of good GAS COALS required by them during a period of One or Three Years, to be delivered either free alongside their Wharf South Side of Canal Basin, Gravesend, or f.o.b. Vessels in accordance with their Specifications.

The Quantity required will be about 12,000 Tons per year.

Copies of the Specification and Form of Tender may be obtained of Mr. Joseph Davis, the Company's Engineer, Gas-Works, Gravesend.

Tenders to be sent in on or before Monday, Sept. 30, 1895, addressed to the Chairman, Gravesend and Milton Gaslight Company, 27, King Street, Gravesend.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
CHAS. R. GRAMSHAW,
Secretary.

27, King Street, Gravesend.

WALLASEY URBAN DISTRICT COUNCIL.

TO ENGINEERS AND OTHERS.

THE Wallasey Urban District Council invite TENDERS from Manufacturers, for the supply, delivery, and erection and completion of a SULPHATE of AMMONIA PLANT at their Gas-Works, Great Float, near Birkenhead.

Plans and Specification may be seen, and Particulars and Form of Tender obtained, on application to Mr. J. H. Crowther, Engineer, at the Works, as above.

Sealed tenders, on the proper form, addressed to the Chairman of the Gas and Water Committee, and endorsed "Sulphate Plant," to be delivered at my Office, as below, not later than Four o'clock in the Afternoon of Thursday, the 19th inst.

The Contractor will be required to enter into a bond, with approved sureties, for the due performance of the contract.

The Council do not bind themselves to accept the lowest or any tender.

By order,
W. DANGER,
Clerk to the Council.

Public Offices, Church Street,
Egremont, Sept. 6, 1895.

CARNARVON CORPORATION GAS-WORKS.

THE Gas Committee invite Tenders for the surplus TAR produced at their Works for One Year ending Sept. 30, 1896.

The quantity of Coal carbonized will be about 2000 Tons.

Further Particulars may be obtained from the undersigned, to whom tenders must be addressed not later than Saturday, Sept. 21 inst.

THOMAS WILKINSON,
Manager.

Gas Office, Carnarvon,
Sept. 6, 1895.

CITY OF BELFAST.

CONTRACT FOR COAL.

THE Gas Committee of the Belfast Cor- poration invite TENDERS for the supply of 90,000 Tons of best screened GAS COAL, to be delivered free and trimmed in Barges at Belfast Harbour, between the 1st of November, 1895, and the 31st of October, 1896.

No Tender for less than 10,000 Tons will be considered.

Monthly Quantities and Particulars may be obtained from the Manager of the Gas-Works.

Tenders, on office forms, endorsed "Tender for Coal," should be delivered at my Office not later than the 2nd of October.

The lowest or any tender not necessarily accepted.

SAMUEL BLACK,
Town Clerk.

TO TAR DISTILLERS AND MANUFACTURING CHEMISTS.

THE Windsor Royal Gaslight Company are prepared to receive TENDERS for the purchase of their surplus COAL TAR and AMMONIACAL LIQUOR (10-oz. Liquor) for One Year, from the 1st day of October, 1895.

The Tar will have to be removed in Barrels; but the Liquor can be pumped into Railway Tanks on the Great Western Railway.

The Contractor must be prepared to keep the Company cleared of both Tar and Liquor, and to provide all the necessary Barrels for the purpose.

The Directors do not bind themselves to accept the highest or any tender.

Any further information may be obtained on application to Mr. J. Wadeson, Manager.

Sealed tenders, stating price at the Company's Works free of all charges, must be sent in by Twelve o'clock at Noon on Tuesday, the 1st day of October, 1895.

By order,
JOHN HENRY STRANGE,
Secretary.

Gas Offices, Victoria Street, Windsor.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ASSEMBLY of Proprietors will be held at the Company's Offices, St. Helen's Place, Bishopsgate, E.C., on Thursday, the 3rd of October, 1895, at Twelve o'clock Noon precisely, pursuant to Act of Parliament.

The TRANSFER BOOKS in respect of the ORDINARY STOCK WILL BE CLOSED on the 19th of September, and RE-OPENED on the 10th of October, on which day the Dividends on this Stock will be payable.

By order,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place, E.C.,
Sept. 6, 1895.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 25th inst., at Half-past Twelve o'clock precisely, to transact the usual Business, to declare a Dividend for the Half Year ended the 30th of June last, and to elect two Directors and One Auditor in the place of those who go out by rotation, but who are eligible to be re-elected.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 14th and RE-OPENED on the 26th inst.

By order of the Court of Directors,
FREDERIC LANE LINGING,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
Sept. 4, 1895.

NOTICES FOR POSTING IN GAS-WORKS.

CARDS suitable for Exhibiting in Gas- Works, directing Officers and Workmen to REPORT all ACCIDENTS witnessed by them, together with the Clause of the "NOTICE OF ACCIDENTS ACT, 1894," specifying the notice required to be sent to the Board of Trade, can be obtained, *price 4d. each, or 2s. 6d. per dozen, post free.*

Section 4 of the "CONSPIRACY AND PROTECTION OF PROPERTY ACT, 1875," has been similarly printed. It is required, under a Penalty of FIVE POUNDS, that a Copy of the Section shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by persons employed thereat. Copies, in large type, on broad sheets (22½ inches by 17½ inches) may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C. *Price 2s. per dozen; 10s. 6d. per 100.* On Cards the same size as those relating to the "Notice of Accidents Act," *price 4d. each, or 2s. 6d. per dozen.*

NOTICE.

TO GAS ENGINEERS AND OTHERS.

MESSRS. CLAPHAM BROS., Limited, Keighley, Yorkshire, are no longer authorized to Manufacture my CONDENSER and WASHER-SCRUBBERS.

The above-named Gas Apparatus are erected and giving entire satisfaction at the following places: Neath, Lincoln, Sheffield, Ellesmere, Mountain Ash, Malden, Cullingworth, Montreal (Canada), Woodstock (South Africa), Cape Town (South Africa), &c.

These Appliances can now be obtained solely of the undersigned.

Winchester House, London, E.C. J. A. KELMAN.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, E.C.,
And at STROUD, GLOUCESTERSHIRE.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

NOTICE.

The Incandescent Gas-Light Company, Limited, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

"The Incandescent Gas-Light Company Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo,* **Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment said:—**

The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it, he must be bound by the condition."

In the case of *The Incandescent Gas-Light Company v. Hirschfeld and Others,* **the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.**

(Signed) FAITHFULL & OWEN,
Solicitors for the Incandescent Gas-Light Company, Limited.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

AUTOMATIC

COAL and COKE HANDLING.

We have erected, and are erecting, a number of the most complete

AUTOMATIC COAL AND COKE HANDLING PLANTS

In the World.

☛ We are now engaged erecting a plant to distribute the Coal into 375 Coke-Ovens, each 30 feet long, and convey the HOT Coke on an improved Conveyor to the Blast-Furnaces. We have also on order six Plants to elevate and convey from 200 to 2000 Tons of Coal per day. For the latter, we are supplying three Conveyors, each 72 inches wide, with Cast Steel Chain Elevators and Accessories to suit.

Address:—

NEW CONVEYOR COMPANY, LD.,

3 & 4, Lime Street Square, London, E.C.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS:—

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE, 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . $13\frac{1}{2}$ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor $94\frac{1}{2}$ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES, NEWCASTLE-UPON-TYNE.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . . 10,500 Cubic Feet.
Illuminating Power . . 16·9 Candles.
Coke . . . . . 66·7 Coke.
Sulphur . . . . . 0·86 Sulphur.
Ash . . . . . 2·04 Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,
FITTER.

TO EMPLOYERS, COMPANY DIRECTORS, ETC.

The LAW GUARANTEE & TRUST SOCIETY,

LIMITED,

GUARANTEES FIDELITY.

Send for complete Prospectus, containing Balance-Sheet, Copy of Policy, &c., &c.

HEAD OFFICE:

49, CHANCERY LANE, LONDON, W.C.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, MINER, AND SHIPPER OF

NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

5, PRINCES STREET, PORT GLASGOW.

Telegrams: "HUNTER, PORT GLASGOW."

Established 1872.

LOW MOOR BLACK BED

GAS COAL.

YIELD OF GAS PER TON . 10,375 CUBIC FEET.
ILLUMINATING POWER . 17·50 SPERM CANDLES.
COKE. . . . . 75 PER CENT.

Prices, f.o.r. or f.o.b., on application to

GEORGE & JOHN HAIGH,

RAVENS LODGE AND CONYERS' COLLIERIES,

DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

KENT'S THICK GAS COAL

RAISED AT

The Wharncliffe Woodmoor Colliery,

BARNSLEY.

Yield of Gas, nearly 12,000 *Cubic Feet per ton of Coal; and Illuminating Power nearly* $17\frac{1}{2}$ *Candles.*

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham:—

Specific Gravity (Water 1). . 1·276
Weight of One Cubic Foot. . 79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal . . . . . 2·68 per cent.
Volatile Matter. . . . . 35·60 ,,
Fixed Carbon . . . . . 58·80 ,,
Sulphur . . . . . 0·96 ,,
Ash. . . . . 1·96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal . . . . 11,760 cub. feet.
Gas per Cubic Foot of Coal . 418 ,,
Illuminating Power . . . . 17·44 candles.
Value of One Cubic Foot in Sperm . . . . . 418 grains.
Value per Ton of Coal in Sperm . . . . . 703 lbs.
Coke per Ton of Coal . . . 1367 ,,
Coke . . . . . 61·05 per cent.
Ash in Coke . . . . . 3·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal 9·4 lbs.
Sulphur in Coke per Ton of Coal . . . . . 12 ,,
Ammoniacal Liquor per Ton of Coal . . . . . 19·7 galls.
Tar per Ton of Coal . . . . 12·2 ,,

R. O. PATERSON, C.E.

Gas-Works, Cheltenham,
8th August, 1894.

For Price, &c., apply to the

Wharncliffe Woodmoor Colliery Co

LIMITED

BARNSLEY;

Or to **Mr. W. H. HARVEY,**

17, Old Queen Street, Westminster, S.W.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

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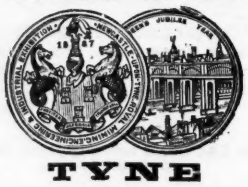

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Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

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Coke . . . . . 70 per cent.

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WORKED BY THE

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OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

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Illuminating Power . . 16·9 Candles.
Coke (of good quality) . . 67·5 per Cent.
Sulphur . . . . . 0·58 ,,
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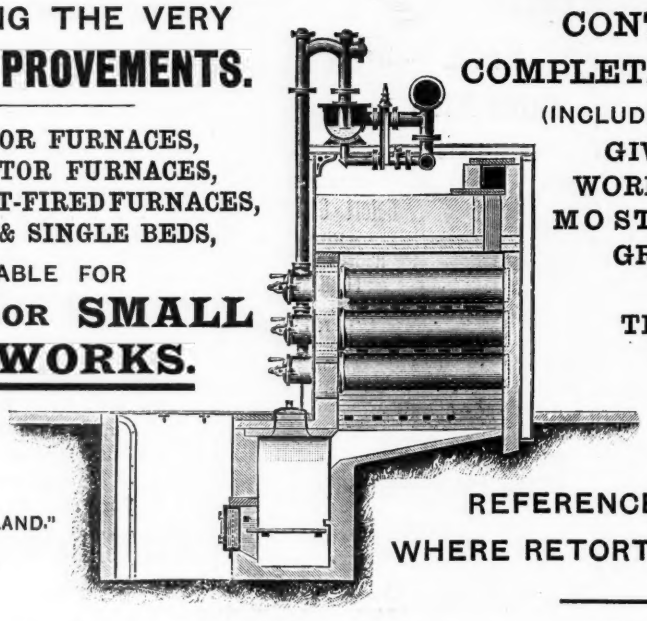

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GIVING THE HIGHEST WORKING RESULTS, THE MOST PERFECT HEATING, GREATLY INCREASED DURABILITY, THE LOWEST FUEL CONSUMPTION.

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INCANDESCENT MATERIALS

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Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

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THE FIRST PRACTICAL AUTOMATIC GAS-METER

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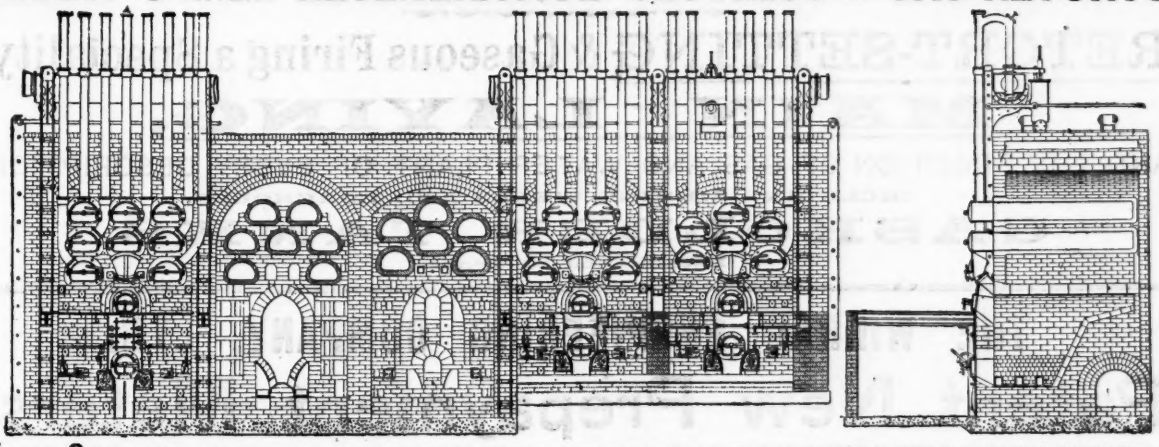
HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: Messrs. JONAS DRAKE AND SON, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; C. M. HAMILTON, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, R. F. HISLOP (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non* TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

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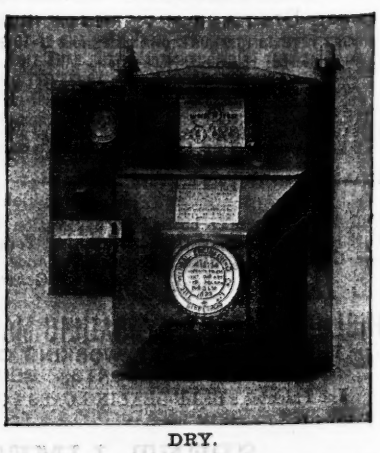

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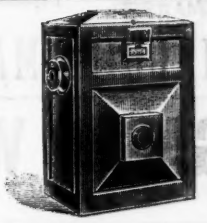

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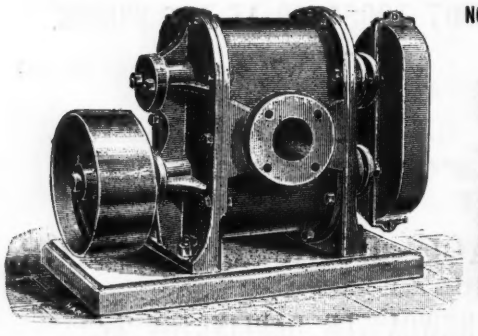

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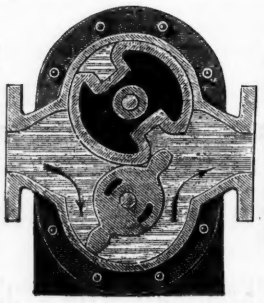

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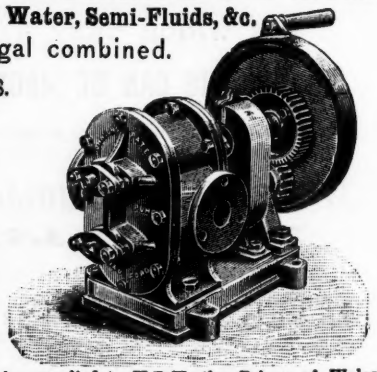

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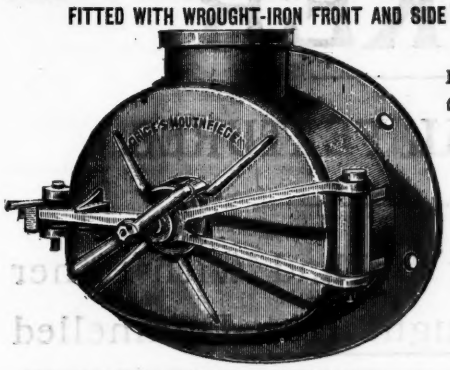

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[See Illustrated Advertisement, Sept. 3, p. 511.]

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[See also Advt. p. 526.

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